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Heating Piping & Air Conditioning

DESIGN
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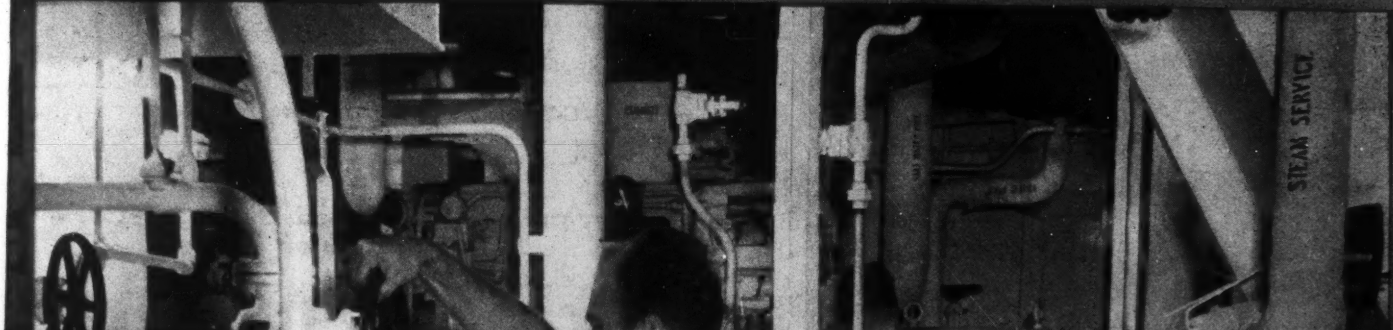
INDUSTRIAL
COMMERCIAL
AND LARGE
BUILDINGS

703: Journal Section of the American Society of Heating and Ventilating Engineers



Pipe, Valves and Fittings Go to War, as Shown in This View of the Engine Room of a Patrol Craft Escort Ship

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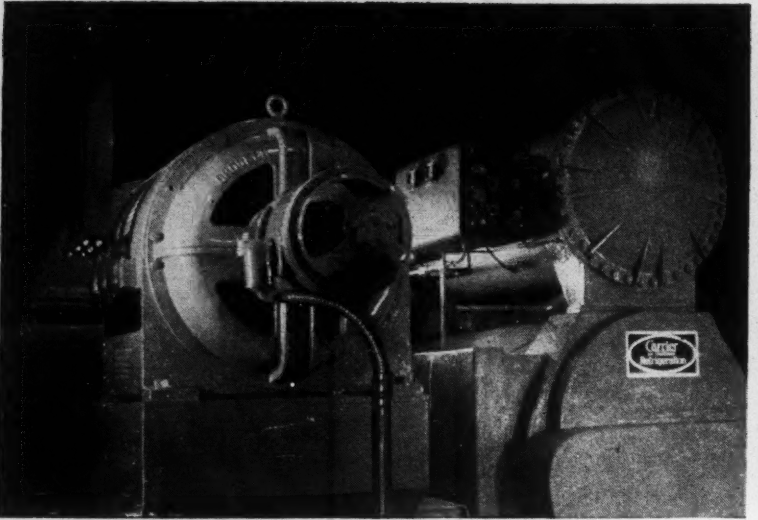
CROCKER-WHEELER POWER for AIR-CONDITIONING EFFICIENCY



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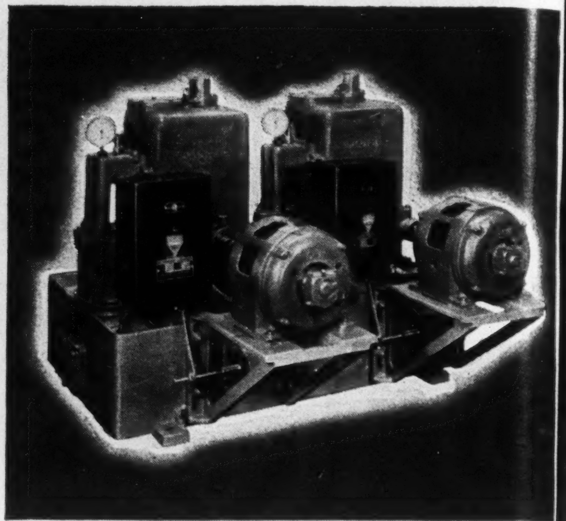

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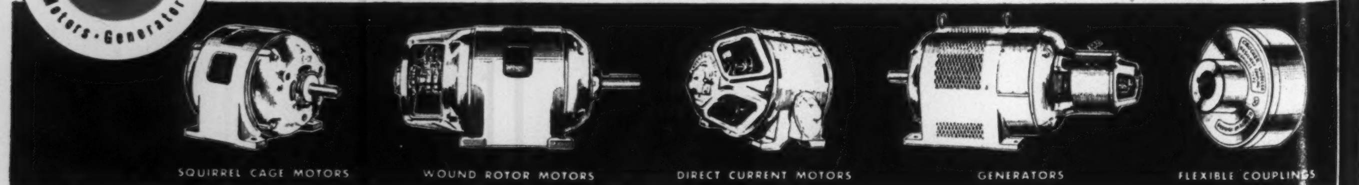

Heating Piping & Air Conditioning

with which is merged the Aerologist

Design, Installation,
Operation, and Maintenance:
Industrial, Commercial,
and Large Buildings

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Published monthly by the Keeney Publishing Co., 6 North Michigan Avenue, Chicago 2, Illinois. Telephone: State 6916. Subscriptions: U. S. and possessions, Canada, Mexico, Central America, South America, $2.00 per year; other, $4.00. Current copies, U. S. and possessions, 25c each, back copies, 50c each. January 1944 issue, $1.00 per copy. Member of the Audit Bureau of Circulations and of the Associated Business Papers, Inc. Copyright 1944 by the Keeney Publishing Co.

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Economy

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Open for Discussion

ARE WE LIMITING AIR CONDITIONING SALES?

THE EDITOR—

In the early days of the automobile industry, the buying public was offered, through attractively illustrated advertisements in national publications, what was then called a "pleasure car." Then World War I came along and the fact that automobiles had been represented as "pleasure cars" rather than necessary transportation forced the industry to do a "right about face" and try to sell the public on the fact that, after all, automobiles were *not* pleasure cars but a sound and economical means of transportation which we actually could not get along without if the war effort was to proceed on the desired schedule.

In World War II we have a repetition of the situation in the air conditioning field. Summer air conditioning was originally offered to the public as "comfort cooling." Very likely, those in the industry did not then realize how extensive the benefits of proper air conditioning could be, but it did not take them long to realize it, and they went ahead with commendable effort to sell these new markets and to develop still further markets for air conditioning without, however, giving thought to the fact that often they were still letting it parade under the certainly indescriptive name of "comfort cooling."

Quite naturally, when wartime priorities were imposed the WPB took the industry's own valuation as to the essentiality of air conditioning, reasoning the industry itself admitted it was a luxury item because it called it "comfort cooling." Can you blame the WPB for such reasoning?

Now, before it is too late, even though we are somewhat in the position of locking the barn door after the horse is stolen, why not let's begin calling it "efficiency cooling"—for air conditioning properly applied certainly goes far beyond mere comfort. You can actually measure its benefits in dollars and cents—in better health, in better employee morale, in greater production, in reduced errors, in the conservation and preservation of food and perishables, in the prevention of waste and spoilage, in more profitable retail operations through building a larger clientele and creating more favorable conditions for them to spend their dollars, and so on and so on ad infinitum.

So let's quit voluntarily putting air conditioning in the luxury class and make it an essential industry by simply using the proper nomenclature.—L. C. BLAKE, advertising manager, Curtis Refrigerating Machine Div. of Curtis Mfg. Co.

SAVE STEAM BY SHORT HOUR HEATING

THE EDITOR—

The study by Earle Shultz summarized in the November HPAC, regarding the possibility of reducing fuel consumption by restricting the hours of heating, refutes the popular fallacy that it is almost as cheap to keep heat turned on all night as it is to discontinue it, because of the extra heating load involved in bringing the building up to comfortable temperatures in the morning. The loss of heat from a building is a factor of the difference in temperature between the inside and outside. Ordinarily, the outside temperature is lower at night than during the day, so that if heat were supplied for the 24 hr period there would be a greater heat loss during the night hours. If a building is allowed to cool 10 to 20 deg at night, the loss of heat per hour will be considerably less. This is accentuated by the fact that there is no sun heat at night. Furthermore, there is no heat added to the building at night from tenants, lighting fixtures, motors, etc. However, the incremental fuel consumption for the additional hours of heating would be at a rate somewhat less than the average, since during these hours sufficient steam is needed only to maintain room temperatures and not bring the rooms back to temperature.

There is a similar reduction in fuel consumption for hot water generation if steam for hot water storage tanks is shut off when not needed at night. There is a continuous loss of heat from the hot water system due to radiation and conduction from the steam connections, the storage tanks, and the entire hot water supply and circulating piping. Tests have shown that in office buildings steam use may be reduced by about one-third if steam can be turned off for 10 hr.

In attempting to economize on the use of morning steam by turning it on at a late hour, care must be exercised not to overlook the fact that some time is required for the building walls, floors, and ceilings, and the tenants' furniture and fixtures, to be brought up to temperature after the air in the space has been heated to the desired degree. Radiation from the body to cold objects, especially metal desks and chairs, will cause the occupants to feel cold even though the thermometer reaches 70 deg. However, in this year of critical coal charges, measures of this kind may prove to

When engineers gather to hear a paper or talk, there comes a time when the meeting is thrown "open for discussion." Some of the audience may offer comment amplifying the speaker's remarks, others will disagree with points the speaker may have made, and some will want to ask questions for the speaker to answer . . . We follow this custom in these columns, which provide an opportunity for readers to comment and discuss articles published in HPAC and other topics of interest to heating, piping, and air conditioning engineers and contractors. Others are interested in your views on these matters, and the editors will welcome your remarks. Address them to Heating, Piping & Air Conditioning, 6 North Michigan Avenue, Chicago 2, Illinois

be the most acceptable means of conserving fuel.—L. W. MAUGER, supervising engineer, Brown, Wheelock, Harris, Stevens, Inc. (Real Estate).

HEATING, VENTILATING, AND AIR CONDITIONING HOSPITALS

THE EDITOR—

J. G. Mench has, from the standpoint of the hospital administrator as well as the engineer, written a timely and excellent article on Heating, Ventilating, and Air Conditioning Hospitals, in the November HPAC.

Referring to the first paragraph of Mr. Mench's article, probably the most important factor involved in the demand for increased hospital facilities has been the advance in medical science through the years, creating at regular intervals new diagnostic methods, new therapeutic treatments, and new and more involved types of surgery, all of which require the facilities and multiple types of technical personnel of our modern hospitals. This is very important and can be proved by the fact that increased use of hospitals has been just as rapid in areas where there are no insurance plans for hospital care as in areas where these plans have found wide acceptance.

Whereas Mr. Mench refers specifically to double glass glazing of windows in operating rooms, it is important to know that the use of glass block is one of the very best methods for securing dead air insulating space. As a matter of fact, there is some tendency toward eliminating windows entirely in operating rooms. I personally am against this as it is a fact that many people have to work in operating rooms for considerable periods of time during the day other than the time when actual surgical operations are going on. Because of this, it is important to have natural light in the operating rooms to avoid excessive use of electrical current. I personally am a great believer in complete air conditioning of operating rooms.

In connection with the discussion of types of heating systems for hospitals, those of us who have visited and gone completely through many hospitals in all parts of this country and Canada are always struck by the fact that the average hospital always seems to be badly overheated and I am inclined to believe that this is due to overradiation.

As to hospital air conditioning, progressive hospitals, particularly those of 100 beds and over, should have a few special patient rooms with complete air conditioning. These rooms would be used for the treatment of certain types of allergies and for general research on the subject of effect of atmospheric conditions on various types of clinical cases. The effect of controlled air conditioning on the efficiency of surgeons and nurses is of paramount importance in giving the best possible care to patients.

I do not agree with Mr. Mench's statement that it is particularly desirable to provide recovery rooms with complete air conditioning for post-operative cases. To date, there are no clinical data to prove that these specialized recovery rooms have any particular merit.

I think it is a fine thing for various technical journals to publish articles pertaining to hospitals. The more everyone in the journalistic field can help citizens on various phases of hospital problems, the better off the general public will be.—E. W. JONES, vice-president, Modern Hospital Publishing Co., Inc., and WPB consultant on hospitals.

NAMES FOR THINGS

THE EDITOR—

I read with amusing interest Samuel R. Lewis' article in the February HPAC under the heading of Names for Things, and thoroughly agree with him that some of the nomenclatures that are attached to some products are far from being a true designation as to just what they are and what they will do. Furthermore, some names are likely to be misleading unless the full story is known. Mr. Lewis very wisely did not discuss relative performance.

W. A. Evans, in his comments on page 536 of the September HPAC, has strayed from the subject, Names for Things, and has indulged in a discussion of the relative merits of certain products. With all due respect to my friend Bill, I cannot agree with his remarks on the design purpose and performance of nonstratifying, or what is better known as steam distributing tube, convectors.

In the first place, let's be honest with ourselves, the industry, and the public at large by stating that so far no convector has been built in which the condensate from steam supplied to it will not be frozen under certain operating conditions. I could name these conditions but that would be taking up valuable space for the discussion of self-evident and elementary facts.

I think that we all will agree that the conventional type of convector of single tube construction with supply and return headers at opposite ends cannot be operated under a variable low pressure steam supply without producing stratification in the stream of air passing over it, and when exposed to subfreezing air will not only produce stratification but will also cause freezing of the condensate in its passage through the tubes.

The nonstratifying or steam distributing tube type of convector was designed primarily for use in conjunction with an automatic system of temperature control that is capable of intermediate or floating action, and for the purpose, as its name implies, of even delivery of steam at low pressure (0 to 5 psi) regardless of the quantity supplied to all parts of the condensing tubes and thereby eliminating stratification or uneven temperatures of the air leaving the convector regardless of the temperature of the incoming air. When this has been accomplished, inherently, freezing of the condensate will be eliminated.

The critical point of operation is when the incoming air is at the freezing point (32 F) and the volume of steam being supplied to the convector corresponds to the amount required to produce a minimum temperature rise. The lower this minimum temperature rise, the shorter the tubes of the convector must be in order that this volume of steam may reach the full length of the tubes. Thus there is a definite relation between the minimum temperature rise from 32 F and the tube length of the convector. It can be readily seen that with only enough steam being supplied to produce a temperature rise of 3 F (32 F to 35 F), or even a 13 F rise (32 F to 45 F), that stratification and possible freezing of the condensate would not be eliminated with too long tubes, unless a control device was placed in the leaving air stream directly off of the convector and at the most distant point from the steam supply end. If the temperature of the air is to be controlled as it leaves the convector, then with tube lengths within the practical maximum length and the proper design of the distributing tube, the control device can be located at any convenient point in front of the face area of the convector, or at some remote point in the leaving air stream (such as in the discharge duct from the fan).

Practical experience has set a limiting tube length of 72 in. and a minimum temperature rise of 13 F from 32 F, under which conditions of both stratification and freezing of the condensate will be eliminated. It is also essential that the distributing tube be so designed that equal distribution of the steam will take place under both minimum and maximum requirements.

I beg to differ with Mr. Evans in his statement that the nonstratifying or steam distributing tube convector is "unsafe in air temperatures below 35 F, in the experience of users." As a matter of fact, the lower the entering air temperature the larger the volume of steam that must be admitted to produce the temperature rise and the higher the steam pressure, since the valve is wider open, thus reducing the pressure drop through the valve, all of which assures distribution the full length of the maximum practical length tube and eliminates freezing of the condensate.

I also disagree with Mr. Evans in his statement that the "nonfreeze coils" (convectors to Sam Lewis), which is a trade name type, "are both nonstratifying and nonfreeze," unless he qualifies the statement by telling us the minimum rise from 32 F. with low pressure steam and the maximum length tube that can be used at this critical operating point as well as the location of the controlling device and still eliminate stratification.

Mr. Evans states that both the plain and nonstratifying convectors are subject to the same limitations when operating in subfreezing temperatures and "Both must be protected against freezing by low limit thermostats set to throw on full steam, etc." This is definitely not the case with the nonstratifying or steam distributing tube convector as the steam supply can be varied by means of automatic control without the danger of the condensate freezing. The function of a low limit thermostat, as its name implies, may be to prevent too low a discharge temperature for comfort, or to assure a sufficient quantity of steam being admitted under critical operating conditions to eliminate stratification.

With the required volume of steam available and all mechanical devices working perfectly at all times, there would be no need for protection devices such as Mr. Evans mentions. However, practical experience and good engineering practice proves that, regardless of the type of convectors used, it pays to guard against failures due to such things as sticky control valves, inoperative thermostats, clogged traps, and steam failure, any one of which might cause considerable damage and expense.—H. Berkley Hedges, John J. Nesbitt, Inc.

FUEL SAVING CAMPAIGN

The Editor—

I have read the article by Oscar V. Sprague in the November HPAC on the fuel saving campaign at the Kodak Park works, and the Eastman Kodak Co. should be commended in the steps taken to attain the results mentioned. The strong point in making the fuel economies seems to be in the way the program was planned—getting different departments to work together and never letting down on the job. This is mentioned because teamwork always gets results. By careful and proper supervision, with coordination, there is not the tendency for one department or group to put the blame of wasteful operating practices on others. Encouraging suggestions from the employees makes them interested parties and their aid supports the plan. It is also surprising the savings that can be made by stopping a number of small leaks, which over a period of time will amount to more than a person would ordinarily anticipate.—W. H. Wilson, member of HPAC's board of consulting and contributing editors.

SIMPLIFIED STEAM PIPE SIZING

The Editor—

The Unwin pressure drop formula is somewhat limited in its scope of application, but is used in the lower range of pipe sizes and for the lower pressures. For these applications, therefore, the tables given by Charles A. Pohlig in his article on Simplified Steam Pipe Sizing in the October HPAC may prove useful where a number of calculations are required. For conditions which are not preselected to come out right, however, a certain amount of interpolation will be required. Where only a few problems are involved, use of the original formula would not seem particularly objectionable, since a preliminary answer can be obtained by the graphical solution of the Unwin formula which appears in a number of places (for example, page 204 in the third edition of the Piping Handbook, by Walker and Crocker).

An alternate solution of this problem is outlined in the article by B. F. Ruth on Direct Solution of Isothermal Flow in Pipes appearing in the August 1939 issue of Industrial and Engineering Chemistry. This solution is based on the rational flow formulas which provide acceptable results for the entire range of pipe sizes and steam conditions. Four or five steps only are required to make a direct solution for any unknown quantity, assuming, of course, that the other variables are known as for any solution. A modification of Mr. Ruth's method for direct solution of such problems will appear in the fourth edition of the Piping Handbook.

It would appear that the usefulness of Mr. Pohlig's article might have been increased had he pointed out that his tables can be used for determining any of the variables, usually pressure drop, pipe size, or steam flow. An additional example of the latter type might have been helpful. It would be helpful also to indicate in connection with the table headings that the diameters are "inside diameters."

However, Mr. Pohlig's article is a good contribution and should prove helpful to those working in a field where the Unwin formula can be used satisfactorily.—HARVEY A. WAGNER, engineer, The Detroit Edison Co.

WARTIME AND POSTWAR AIR CONDITIONING

THE EDITOR—

I can certainly agree with T. W. Reynolds in his article in the November HPAC that the control of air (air conditioning) in industry has contributed greatly to our war effort. Critical materials, however, were and still are primarily restricted from use by nonessential industries not directly connected with the war effort. Such nonessential industries, desiring to obtain the benefits to be realized by the installation of air conditioning, either had to use substitute materials, noncritical, or do without the contemplated installation entirely, all in order to further the conservation and to enhance the availability of such critical materials for use in the fabrication of air conditioning equipment urgently needed and required by the manufacturers of war material.

By the allocation of priorities, many potential installations for air conditioning have had to be deferred, which has resulted in temporary disappointments of those asking for priorities for such equipment.

Physical comfort alone has not generally been accepted as sufficient justification for the issuance of priorities to permit the installation of air conditioning, nor has the potential increased efficiency of personnel been considered of sufficient merit, during the war period, to permit the use of the critical materials involved.

It would therefore seem very logical to believe that when the current restrictions are removed and air conditioning equipment will again be available to all, that all of the disappointed potential users of air conditioning will avail themselves, at the earliest opportunity, to have the presently delayed installation made at the earliest possible date.

In the meantime, those peacetime industries who were fortunate enough to be allowed the purchase of air conditioning equipment, even though made up of substitute materials, will stagger through this period and be ready and willing to make the much desired replacements after the war is won.—E. P. HECKEL, E. P. Heckel & Associates, consulting engineers. Member of HPAC's board of consulting and contributing editors.

Why Doesn't Boiler Feed Pump Operate?

A QUESTION: In a high pressure steam heating plant with two boilers, vacuum pump, air compressor, boiler feed pump, and indirect heating system, with warm air delivered to occupied spaces by means of a steam engine driven blower, there is difficulty in getting the boiler feed pump to operate during the starting up period. It is found that when the demand for steam in the heating coils is great the boiler feed pump will not operate. The steam reducing valve is then partially closed and the boiler feed pump will operate. After this initial difficulty during the starting up period is overcome and the building heated up, the boiler feed pump operates without further trouble. This condition seemed to develop suddenly. What is the cause?

THE ANSWER: This difficulty, while not common, does arise in plants having more than one boiler. During the morning start up period when the structure is cold, there is the maximum demand for steam and condensation of steam is at a high rate. Evaporation of water from the boiler must also be at a high rate, which will require the boiler feed pump to be in operation more than at any other time. Therefore there is a maximum steam demand during this period. Inasmuch as the plant operates normally after maximum steam demand it is obvious that something is interfering with the quantity of steam being delivered. Since the difficulty developed suddenly, it is evident that pipe sizes are not at fault.

A survey on a similar problem indicated that the steam was being restricted at the stop and check valve. The valve was taken apart and an examination showed that binding had taken place that would not permit the valve to open properly. After the valve was repaired, no further difficulty was experienced. The stop and check valve in multiple boiler installations is an important part of the boiler equipment. These valves require inspection and maintenance as well as other equipment. Too often, because they may be difficult of access, they are neglected until they fail to operate. A sticking stop and check valve is dangerous. They are designed to open gradually with a rise in steam pressure but defects may cause them to open suddenly with a sledge hammer effect and disastrous results. Never correct stop and check valve trouble by removing operating parts. Strange as it may seem this method has been employed, but the operator who does it is flirting with disaster.—ANDREW W. SULLIVAN, supervising engineer, Chicago Board of Education.

130
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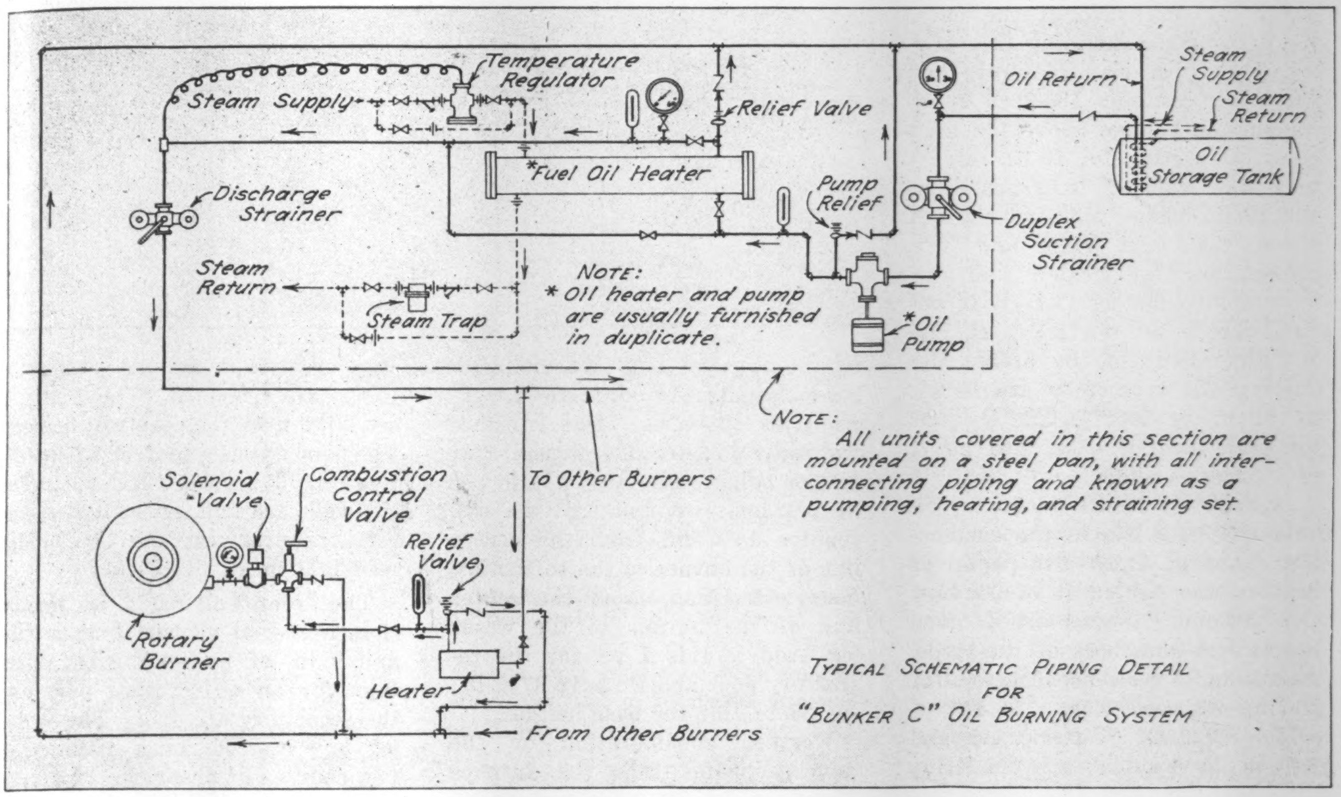
Practical Pointers

A "practical pointer" on steam heating plant operation from Scotty-Grams, a bulletin issued to engineering personnel of the Board of Education of the City of Chicago, of which John Howatt, a member of HPAC's board of consulting and contributing editors, is chief engineer, is given here


Temperature Regulator
Steam Supply
Relief Valve
Fuel Oil Heater
Discharge Strainer
Pump Relief
Duplex Suction Strainer
Steam Return
Steam Trap
Oil Pump
Oil Return
Steam Supply
Steam Return
Oil Storage Tank
Solenoid Valve
Combustion Control Valve
To Other Burners
Relief Valve
Rotary Burner
Heater
From Other Burners

NOTE: * Oil heater and pump are usually furnished in duplicate.

NOTE: All units covered in this section are mounted on a steel pan, with all interconnecting piping and known as a pumping, heating, and straining set.

TYPICAL SCHEMATIC PIPING DETAIL FOR "BUNKER C" OIL BURNING SYSTEM

How to Design and Install an Oil Burning System

Fred Meyer Reviews Selection and Sizing of Equipment for a Plant Comprising Three Locomotive Firebox Type Boilers Fired by Rotary Oil Burners . . . Information Included on the Piping, Pumps, Controls, Heaters, Etc.

IN MANY AREAS formerly served more economically by coal, changes in petroleum refining and distributing facilities brought about by the war may make fuel oil available at a comparable cost when a peacetime economy returns to America. To the engineer, contractor, or owner making a selection of fuel to be used for a heating facility, many factors must of necessity be considered. When this study results in the choice of oil, it follows that the proper design of the oil burning system to be used becomes a matter of prime importance.

In the burning of oil for heating a plant or large building, three cardinal principles must be observed. The oil must be atomized; it must be intimately mixed with air; and the mixture must be burned in suspension in the presence of a refractory material. Failure to observe any one of these principles will result in improper combustion. The rotary cup type of oil burner offers a practical solution to a wide variety of oil burning problems. This burner is generally used on applications of from 25 to 450 hp.

A spinning cup, rotating at 3400 rpm, atomizes the oil by centrifugal action, while a fan on the same shaft provides from 10 to 20 per cent of the air necessary for combustion. An air cone of special venturi design concentric with the spinning atomizer cup is so arranged as to mix intimately this air with the atomized particles of oil. This air is known as primary air.

The fan housing and casing, the secondary air door, and the motor are other principal parts of the burner. The burner is mounted on a burner front plate by means of a swivel so that the cup is readily accessible for cleaning.

Let us assume that we have a plant whose peak load is 350 hp at 100 psi steam pressure. To handle this load, three boilers are installed of the locomotive firebox type, 150 hp each, 125 psi pressure design. Two boilers are to be used under peak load conditions, with the third boiler for standby, cleaning, and future expansion. It is desired to obtain 200 hp from each boiler.

Our first problem is to determine the setting height of the boilers. Since we desire 200 hp, our first step would be to determine from the manufacturers' catalog the combustion volume in the boiler, from the crown sheet to the water leg, exclusive of the base. We find, upon examining the catalog of a typical manufacturer, that his boiler contains 183.2 cu ft of combustion volume above the mud ring. Deducting for 10 in. refractory side walls, 9 in. front arch, and 13 in. bridge wall, two courses above the mud ring and five courses for the bridge wall, we have approximately 11.1 cu ft deduction or a net of 172.1 cu ft. The net dimensions of the firebox deducting the refractory are 68 in. by 51 in. or 3468 sq in., so that for each inch of base, 2.01 cu ft of volume is added.

In order to insure adequate volume and long life in the combustion chamber, 40,000 Btu per hr of heat release per cu ft of combustion volume is considered good practice in chambers of this type. Assuming 75 per cent efficiency, for 200 hp we need $(200 \times 33{,}475) \div 0.75 = 8{,}926{,}600$ Btu released, and we would require a combustion chamber of 223 cu ft. This would indicate a 25 in. base. $(172.1 + 2.01 \times 25 = 223.)$ To this base height would be added the thickness of the refractory floor, or 7 in., making a total of 32 in.

The boiler would not be set at 32 in., however, due to a second consideration; namely, burning the oil in suspension. The flame shape is conical so that certain minimum distances from the center line of the burner to the finished refractory floor and to the water leg of the boiler must be observed. This information is usually furnished by the burner manufacturer. Typical maximum and minimum dimensions are shown in Table 1. Since we desire to burn 500 lb per hr of oil per boiler (assuming 2½ lb per hr per hp), we find that we will require 18⅜ in. from the center line of the burner to the refractory floor and 12 in. from the center line of the burner to the water leg. Add to this 7 in. for the refractory floor and we have 37⅜ in., say 37 in., for the base height.

Table 1—Typical maximum and minimum boiler furnace dimensions

Oil Firing Rate Lb Per Hr	Min. Furnace Width, In.	Max. Furnace Width, In.	Min. Furnace Length, In.	Max. Furnace Length, In.	Min. Distance Centerline of Burner to Floor of Furnace, In.	Min. Distance Centerline of Burner to Water Leg of Boiler, In.	Min. Draft Rq'd in Furnace, In. Water
50	26	34	40	48	15½	8½	0.04
75	28	36	45	52	18⅜	9½	0.05
100	30	40	50	58	18⅜	9½	0.05
175	36	44	60	68	18⅜	9½	0.08
275	40	48	72	80	18⅜	12	0.13
375	44	54	80	88	18⅜	12	0.18
500	50	60	84	96	18⅜	12	0.20
590	54	64	84	96	24½	14½	0.20
825	60	68	90	100	24½	14½	0.25

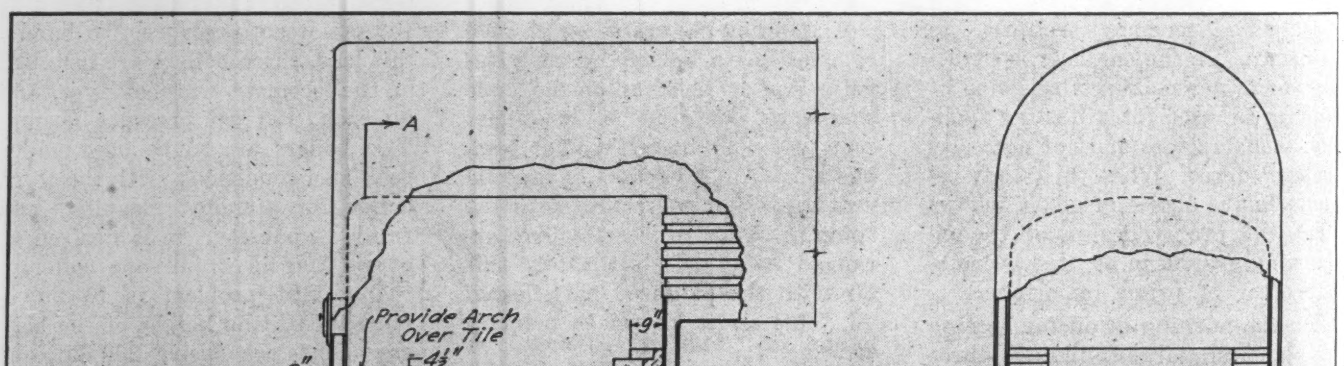
Further consideration of the table indicates that the furnace width of 51 in. is satisfactory; however, the furnace length, the distance from the burner nozzle to the bridge wall, is only 77 in., whereas the table shows a minimum distance of 84 in. is required. Four inches of the necessary 7 in. may be obtained by cutting the thickness of the bridge wall from 13 in. to 9 in. and the balance may be obtained by moving the boiler front plate back from the front of the boiler.

The combustion chamber is constructed of insulation and No. 1 refractory firebrick. The joints are staggered and proper expansion joints are provided. The brick is set with high temperature cement. The floor consists of 2 in. of insulation and 5 in. of firebrick. The sidewalls are 1 in. of insulation and 9 in. of firebrick, and the bridge wall is 9 in. of firebrick.

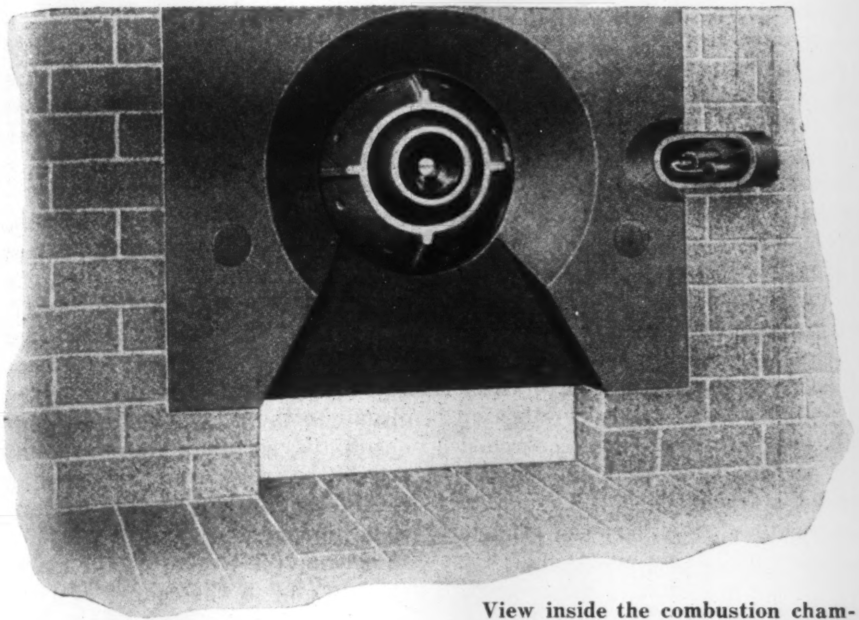
The front wall has 2 in. insulation, a special venturi burner tile, and 9 in. of firebrick, with openings for an observation port and the secondary air door. The water leg is protected for a distance of two courses of firebrick. If plastic firebrick is preferred, the same general scheme may be followed.

In order to make the combustion chamber tight against air leaks, it is wise to hang the burner and burner plate and then work back to the bridge wall, placing the refractory on the front wall and then building the side walls.

In designing combustion chambers in which economic or horizontal return tubular boilers are involved, it is important to note that best results are obtained when the heat release is held below 30,000



SECTIONAL VIEWS OF A COMBUSTION CHAMBER



View inside the combustion chamber looking at the front wall

Btu per cu ft. In this type of boiler the proportion of black surface is lower than in the conventional firebox type, thus making the rate of heat transmission lower with consequent greater wear on the firebox.

When the firebox reaches 5 ft in height, it is good practice to air cool side walls and floor; this is true particularly when a continuous high rate of firing is contemplated.

Installing the Storage Tank and the Piping

In designing the tank size, assuming a six-day week and a 10-hr day, we find a peak consumption of approximately 1150 gal of oil per day or 6900 gal per week. This would indicate the use of bunker C oil because of its high Btu value per gal as well as its low cost. The size of the fuel oil storage tank would depend upon the length of time necessary to receive a 10,000 gal carload of oil from its shipping point. Assuming a 10-day shipping period, a 20,000 gal tank would be ample as it would provide almost three weeks of storage capacity at peak load.

A 1¼ in. steam line with flexible hose connection is provided for steaming the car, and a 4 in. fill line with flexible hose is provided for unloading the oil from car to tank. The tank vent should be the same size as the fill line, should be goosenecked to prevent water entrance, and should be high enough above ground to be above any possible snow drift.

A vertical spiral steam coil made up of about 125 ft of 1¼ in. pipe and 16 in. in diameter is placed in the tank and properly trapped. Two 2 in. suction lines, one high (18 in. from tank bottom) and one low (8 in. from tank bottom) are placed in the tank in the center of the spiral coil. A manhead, 20 in. in diameter, is provided for the entrance of the coil to the tank. The temperature of the coil is maintained by a steam temperature control valve with a remote control bulb placed in the tank. A 2 in. oil return line is used and the suction and return are run together with the steam line to the boiler room. This may be done inexpensively by wrapping the lines with tar felt and running them in split tile insulated with rock wool.

The tank is buried underground 24 in. below grade and resting upon a 12 in. reinforced concrete slab, the slab being 2 ft longer and 2 ft wider than the tank. When the slab is poured, five sets of rods are placed in it, and when the tank is in position it is held in place by the rods and turnbuckles to the slab. Adjacent to the 20 in. manhead already provided, an 18 in. manhead is placed for access to tank. The two manheads and all pipe connections, including a 1 in. gage opening, are so arranged that a rectangular opening 6 ft by 4 ft brought to grade with 6 in. concrete walls with a cast iron ring, and a diamond tread steel cover, provides access to all piping from grade level merely by removing the steel cover.

Many installations of fuel oil tanks are made above ground. Where the heaviest residual oils are to be used, this practice is generally not desirable unless the coldest temperature encountered in the location is well above the pour point of the oil. If ground conditions do not permit burial of the tank below the frost line, the possibility of insulating the tank should be carefully considered.

Horizontal steam coils are often installed in tanks so that the temperature of the entire tank can be raised to the desired condition. Since all the oil we intend to use is brought into the boiler room by means of the suction line, it is necessary only to heat the oil in the vicinity of this line. The vertical coil also has an advantage over the horizontal coil in that it

Changes in petroleum refining and distributing facilities brought about by the war may make fuel oil available at comparable cost in many areas formerly served more economically by coal, when we return to a peacetime economy, according to Mr. Meyer, combustion engineer with Mid-West Heat Service, who has been in industrial oil burner work for some 12 years. . . . For best results on such installations—or any installations—the oil burning system from tank to burner must be designed and selected as a coordinated unit. The rotary cup type of oil burner is one that offers a practical solution to a wide variety of oil burning problems; Mr. Meyer starts here with the boilers and goes through the selection and sizing of the equipment for such an installation, including determining the boiler setting heights, combustion chamber design, determining the tank size, installing the tank and the oil and steam piping, the pump and heater selection, functioning of the controls, and other details.

may be removed from the tank by means of the manhead provided for that purpose in the event that service on this item becomes necessary.

The gage line is run in conduit to the boiler room, and the gage, calibrated in gallons, is mounted on a panelboard so that the amount of oil in the tank may be ascertained readily.

If the tank has been buried in ground in which cinders exist, it is essential to back fill at least 1 ft of sand around the tank to prevent acid action on the tank. This simple precaution will greatly increase the life of the tank.

Selecting the Pumps and Oil Heaters

If the tank location is close to the boiler room (within 75 to 100 ft), the oil pumps may be in the boiler room, but if the tank is a greater distance, the pumps should be in a pump house at the tank.

We shall assume the pumps to be in the boiler room. The peak boiler load is 350 hp, or 115 gph, so the pumps will be designed, allowing a safety factor, to handle 3 gpm. They will be the gear type, operating at 20 psi pressure, v belt driven at a speed not to exceed 300 rpm by a 1 hp motor. The pumps will be in duplicate, either being able to handle the capacity of the entire load and both electric driven and cross connected. If desired, one pump could be steam driven instead of electric driven.

The oil heaters will be arranged to heat 3 gpm from 80 to 220 F with 100 psi steam pressure. There will be two heaters each capable of handling the entire load, and cross connected. The heaters will be arranged so that they can be used with any boiler by means of cross connections to the three boilers. A steam pressure regulating valve with bulb will be so inserted that it operates either heater. The heaters will be the straight tube and shell type, of steel, properly baffled, with flanged heads readily removable for cleaning without disconnecting any piping.

The strainers will be cast iron, the suction strainers 2 in. of the duplex type with a lever arm for changeover. The discharge strainers will be 1 in. duplex.

Modern practice has been to build the pumps, heaters, and strainers with their interconnecting piping into a shopbuilt and tested unit. This unit, mounted on a steel pan with channel iron supports for the heaters, can be piped (screwed or welded) under favorable shop conditions into a time- and space-saving, neatly assembled unit, rather than under the unfavorable working conditions of the job.

An electric heater will be mounted adjacent to each burner to assist in making a cold start. This heater will be thermostatically controlled and so arranged that the burner cannot start until the oil is up to temperature. Further, the electric heater will be automatically shut off when the incoming oil is properly heated by the steam heater. The electric heater will be encased in a heater box also containing a builtin basket type strainer and a pressure relief valve. The thermostatic heater control, a thermometer of the separable socket type, and an oil pressure gage will be mounted on the heater box assembly.

Ignition and Control

Automatic ignition of the burner may be accomplished by a gas-electric ignitor system, in which a solenoid gas valve is automatically opened, and a gas pilot is ignited by means of a 5000 volt electric spark caused to play on two electrodes. This gas pilot ignites the atomized oil.

Other devices to be included in the assembly of each burner include a solenoid oil valve, a modulating control system with necessary linkage and metering valve, a vapor switch, a pressure limit control, a modulating pressure control, a stack switch, a low water cutoff, a relay through which the timing of the various controls is accomplished, a flow compensator valve, a fused disconnect switch, and an automatic starting switch with overload, no-voltage, and phase failure protection.

The functions of these various controls may best be understood by following the sequence of operation of the burner. Closing the disconnect switch to the line permits current to flow through the limit controls and the heater tube of the oil thermostat. This completes the circuit through the coil of the electric heater contactor, thus closing the heater circuit. No current is permitted to flow to the oil burner motor until the oil in the heater box has attained the minimum temperature for which the thermostat has been set. This temperature is such that the oil has a viscosity approximating 250 seconds Saybolt Universal. When this temperature has been reached, the thermostat tilts a mercury switch, closing a circuit to the relay. The relay now opens the solenoid gas valve and causes the transformer to throw an electric spark across the ignitors, thus igniting the gas pilot. At the same time the electric motor makes contact and in the course of 10 to 15 sec approaches full speed. The pressure of the primary air from the fan, by actuating the vapor switch, now permits the solenoid oil valve to open, allowing oil to flow to the burner. The modulating control motor controls the oil supply and is interlocked by means of a linkage to the primary and secondary air supply. When the solenoid oil valve has been opened, the modulating motor provides a low fire start, gradually increasing the flame until, in approximately 30 sec, the proper firing range is reached. The stack switch, mounted in the cleanout door at a height opposite the first pass fire tubes, is warmed by the hot gases. This winds a bi-metallic element, tilts a mercury switch, and thus closes a permanent contact on the relay which up to this time has been operating on a holding circuit. This operation also breaks contact to the gas solenoid valve and to the transformer, thus cutting off the gas pilot.

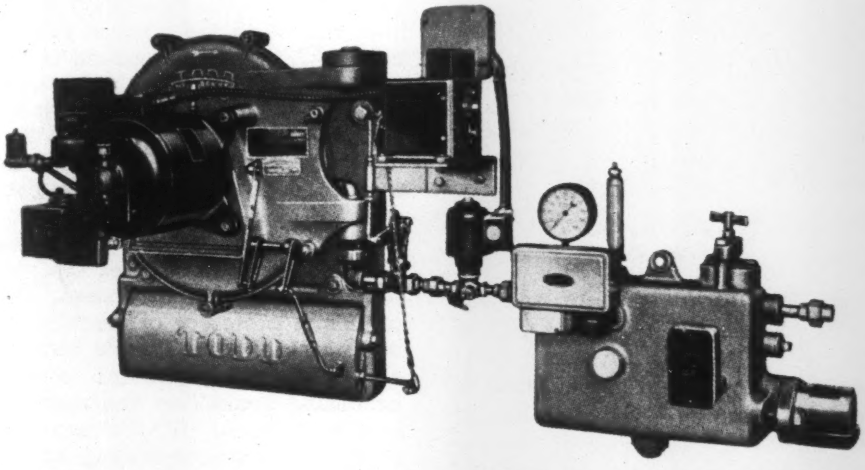
The generation of steam in the boiler now causes the steam preheaters to heat the oil, and when the oil entering the heater box has reached the proper temperature the electric heater is automatically shut off.

As the boiler pressure rises, the modulating control regulates the flow of oil and air to the burner, tending to keep the burner operation in close step with the load variations. Should the rate of firing exceed the load demand, however, despite the fact that the modulating control has cut the burner operation to its lowest point, the pressure limit switch will cause the burner to shut off completely. When the pressure has dropped to the low setting of the pressure limit control, the burner will start again automatically and repeat the sequence of operations already noted.

In the event of flame failure, the stack switch shuts the burner down and restarting the burner cannot be accomplished automatically. The low water cutoff is a simple float switch so arranged that the burner is permitted to operate only when the proper water level is maintained in the boiler.

Sensitive Flame Failure Protection Advisable

The operation of the stack switch, in the event of flame failure, is a function of the time required for the bi-metallic element to respond to temperature change; the time interval is usually 90 sec. This is satisfactory for smaller installations, but in larger installations this timing may be too slow. For example, suppose we were to burn 120 gph per boiler in an installation and the stack switch would require 90 sec to shut off the burner in the event of ignition failure. If the refractory firebrick was still hot it would be possible to obtain delayed ignition and with 3 gal of atomized oil in the combustion chamber an explosion could occur. Although this explosion would not be serious, it could be avoided by the use of a more sensitive flame failure device, such as the photoelectric type. There are several good, time-tested photocell flame failure protection units on the market, and since their initial cost is not excessively high, in view of the excellent function they serve, their use should be recommended on any of the larger oil burning installations.



One make of rotary burner, including the burner itself, ignition assembly, modulating control, starting heater box, and various controls and valves

A constant overfire draft in each boiler would be highly desirable in order to maintain efficient operation. This might be accomplished with an electrically operated overfire draft control, arranged so that when the burner is not operating the damper is shut, and when the burner starting sequence occurs the damper is driven to the wide open position before the burner is permitted to operate.

The steam lines from the boiler to the heaters, and the oil lines, should be covered with four ply asbestos with a 5 oz canvas jacket. The heaters should be covered with 1½ in. magnesia block, properly wired, ½ in. asbestos cement, and 6 oz canvas jacket.

The electrical wiring should be run in rigid conduit with flexible connections made as short as is feasible. A steel panelboard on which is mounted the starting and disconnect switches for the burner, pumps, and electric heaters, and the burner relays, should be placed in such a position that it is in close proximity to the boilers. If possible, the operator should be able to see the boiler fronts from the panel.

It is also possible to mount the fuel oil gage and draft or CO_2 gages (if they are to be employed) upon this panelboard so that the operator will be able to control the important parts of his system from one central location.

Avoid Dead End Piping

When considering the piping layout of an oil burning system employing the heavier residual oils, it is important to remember that, wherever possible, circulating rather than dead end lines should be used. If lines must be dead ended, this distance should be as short as possible. Dead end lines will contain cold oil comparatively difficult to handle. The accompanying piping diagram shows a typical schematic layout for rotary burners, pumps, heaters, strainers, and tank for heavy residual oils. It should be noted that the oil in the tank is heated by returning unused hot oil as well as by the coil in the tank. Valves should be placed so that parts that must be removed for cleaning become readily accessible.

Although the horizontal rotary cup has definite limitations as to range of operation and unsuitability under forced draft, when properly designed and installed under conditions compatible with its scope, this type of oil burning system can provide high efficiency operation with low maintenance cost.

[Drawing of combustion chamber and piping layout courtesy of Mid-West Heat Service. Illustration of burner and inside of combustion chamber courtesy of Todd Combustion Equipment, Inc., Div. of Todd Shipyards Corp.]

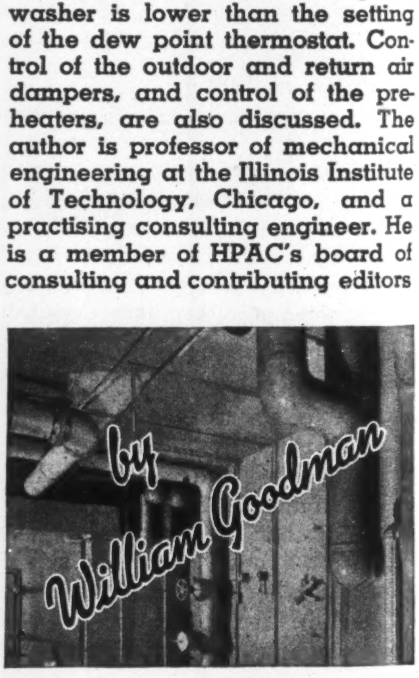
NAMED VICE-PRESIDENT IN CHARGE OF ENGINEERING

William A. Hanley, a member of the board of directors of Eli Lilly & Co., Indianapolis, was elected vice-president in charge of engineering last month, as one of a number of changes made necessary by increasing business in the domestic field and expansion in foreign markets. Mr. Hanley is a member of HPAC's board of consulting and contributing editors, and the author of several articles on industrial air conditioning and process steam piping which have appeared in our pages.

Design and Control of year 'round comfort Air Conditioning Systems

CONTROLLING DEW POINT TEMPERATURE OF AIR SUPPLY IN WINTER

The basic principles that govern the design and control of year 'round air conditioning systems for comfort are organized and discussed in the series of articles of which this is the 10th, and which is devoted to controlling the dew point temperature of the air supply in winter. It is shown that with ordinary air washers having a humidifying efficiency of about 65 per cent, the type of control illustrated in Fig. 24 gives widely varying dew point temperatures depending upon the dew point of the inlet air. With the system shown in Fig. 27, involving heating of the spray water, the dew point temperature of the air supply can be maintained fairly constant if the dry bulb of the air entering the washer is lower than the setting of the dew point thermostat. Control of the outdoor and return air dampers, and control of the preheaters, are also discussed. The author is professor of mechanical engineering at the Illinois Institute of Technology, Chicago, and a practising consulting engineer. He is a member of HPAC's board of consulting and contributing editors



by William Goodman

DURING THE winter months, one of two methods of humidity control can be used in comfort air conditioning systems. In the first and more commonly used method, the dew point temperature of the air supply is controlled. In the second method, to be discussed in the next section, the relative humidity of either the room air or the return air is controlled directly.

In the first type in which the dew point temperature of the air supply is controlled, there will of course be some variation in the relative humidity in the room. However, in comfort air conditioning this variation does not matter because it is easily possible with this type of control to keep the humidity in the conditioned space above the lower limit of 30 per cent.

When controlling the dew point temperature of the air supply, one of two methods is used. Of the two, the most common is a thermostat located immediately after the air washer. This thermostat controls the admission of steam to a preheating coil situated immediately ahead of the air washer as shown in Fig. 24. If the humidifying efficiency of the washer were 100 per cent, such control would accurately control the dew point temperature of the air supply as shown in Fig. 25. The air entering the preheater would always be heated to such a temperature that its *wet bulb temperature* would be equal to the setting of the thermostat. Thus, suppose the thermostat is set at 50 F. If air enters at a dry bulb temperature of 25 F and a dew point temperature of 0 F (point *1*), it would be heated by the preheater to a dry bulb temperature of almost 80 F and a wet bulb temperature of 50 F as shown by point *2*. The air entering the washer would then be humidified and cooled from point *2* to point *3*. At point *3* the air would leave at 50 F saturated if the humidifying efficiency of the washer were 100 per cent.

Effect of Humidifying Efficiency of Washer

If the initial state of the air were represented by point *4* of Fig. 25 instead of point *1*, the air would be heated by the preheating coil to point *5* (also on a wet bulb line of 50 F). With a washer of 100 per cent efficiency, the air entering the washer would then be humidified and cooled to point *3*. Note that regardless of whether the air enters the washer in the state represented by point *1* or point *4*, the final condition of the air is always represented by point *3*. The preheater under control of the dew point thermostat will always preheat the air to a wet bulb temperature of 50 F, the thermostat setting.

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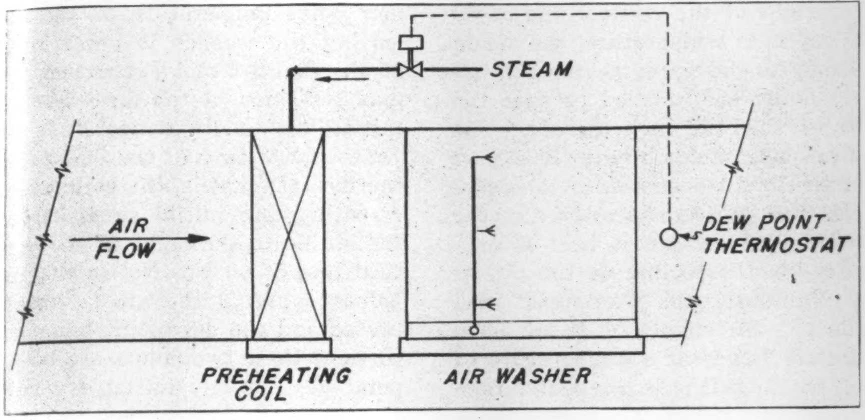


Fig. 24—Commonly used dew point thermostat system of controlling humidity of air leaving air washer. In an installation of this type, the water in the air washer is constantly recirculated without being either heated or cooled

It is possible to obtain air in a constant final state regardless of the initial state of the air only in a washer with 100 per cent humidifying efficiency; that is, one in which the leaving air is completely saturated. However, washers do not have a humidifying efficiency of 100 per cent. The humidification of air for comfort conditioning does not warrant either the cost or the space needed for the installation of long, two bank washers whose efficiency is about 90 per cent. The washers commonly used are either 5 or 7 ft washers which have a humidifying efficiency of about 65 per cent. The use of such washers is satisfactory as long as they are properly controlled. However, a dew point thermostat controlling a preheater coil as illustrated in Figs. 24 and 25 cannot maintain the dew point temperature of the air supply at a constant point with washers of less than 100 per cent efficiency. Thus, suppose the dry bulb thermostat on the downstream side of the washer is still set to maintain a 50 F dew point. Such a dry bulb thermostat can control the dew point of *saturated* air. Inasmuch as this thermostat is always a dry bulb thermostat, the state of the air leaving the washer will be represented by a point somewhere along the vertical line *1-2* of 50 F dry bulb temperature in Fig. 26. If the air enters at 0 F dew point, it will be reheated to such a point that the distance from *3* to *4* is 65 per cent of the distance from *3* to *5* (assuming that the humidifying efficiency of the washer is 65 per cent). The air leaving the washer will, therefore, be at a dew point temperature of 34 F as represented by point *4*. On the other hand, suppose the air enters at a dew point temperature of 25 F. In this case it will only be reheated to a point like *6* such that the distance *6-7* will be 65 per cent of the distance *6-8*. The air will then leave the washer at the higher dew point of 39 F.

Obviously, with ordinary washers of about 65 per cent humidifying efficiency such as are commonly used, the type of control illustrated in Fig. 24 gives widely varying dew point temperatures depending upon the dew point temperature of the inlet air. Not only is it impossible with this type of control to obtain anywhere near a constant relative humidity in the conditioned space, but it is also impossible to obtain even a constant dew point temperature of the air supply. With the dew point temperature of the air supplied varying erratically with the outdoor dew point temperature, there is virtually no control of the humidity in the conditioned space.

In the installation illustrated in Fig. 24, all of the water is recirculated without being heated outside of the washer. All of the heat needed to evaporate the moisture is provided by the preheating coil. In a second type of dew point control, although a preheating coil is provided, the spray water is heated by steam under control of a ther-

Fig. 25—If the humidifying efficiency of air washers were 100 per cent, the humidifying cycle of the apparatus in Fig. 24 would appear as illustrated in this skeleton psychrometric chart

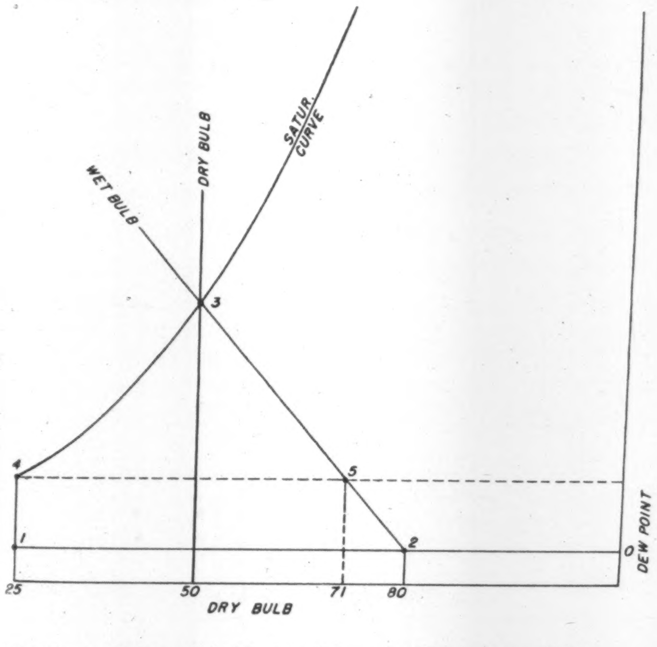
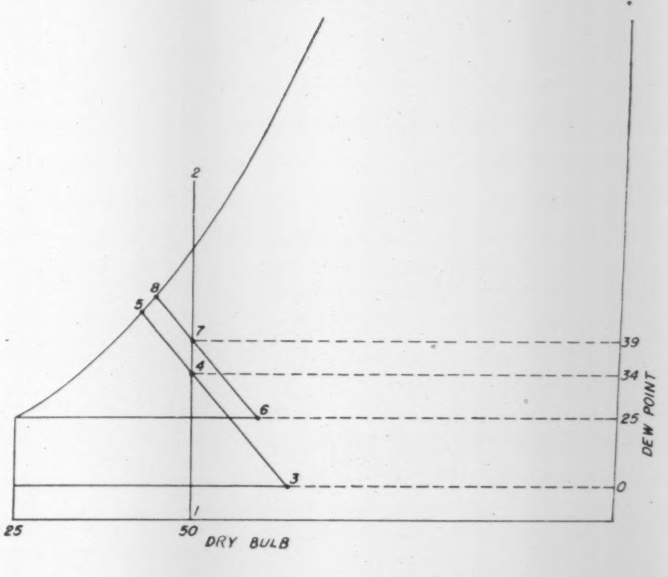


Fig. 26—Psychrometric chart showing the actual cycle for the apparatus illustrated in Fig. 24. Humidifying efficiency of washer assumed as 65 per cent



mostat on the downstream side of the air washer as shown in Fig. 27. The air leaving the preheating coil is usually controlled at some constant temperature. All of the air could be heated by means of hot spray water, but danger of freezing is eliminated and much better control is obtained if, in very cold weather, part of the heat load is carried by a preheating coil. The air leaving the washer is very nearly saturated although there are a few degrees difference between the dry and wet bulb temperatures of the air leaving the washer. Consequently, this means that there will be a slight variation in dew point temperature depending upon the dry bulb and dew point temperatures of the entering air. However, this slight variation is not important in comfort work and for most practical purposes may be disregarded.

Heating the Spray Water Is Advisable

With the control system illustrated in Fig. 27, the dew point temperature of the air supply can be maintained fairly constant under all conditions if the dry bulb temperature of the air entering the washer is always lower than the setting of the dew point thermostat. As long as the dry bulb temperature of the air entering the washer is lower than the setting of the dew point thermostat, the condition of the air will change along a curve like *1-2-3* of Fig. 28 (see page 180 of the book Air Conditioning Analysis, published by Macmillan). With parallel flow of air and water, the air will enter at a temperature represented by point *1* and heat up along the curve to point *2* which lies on the vertical line of 50 F dry bulb temperature —the temperature for which the dew point thermostat is set. At point *2* the air is nearly saturated and the dew point temperature is nearly 50 F. For any initial point like *1* which lies to the left of the vertical line of 50 F dry bulb temperature, the air leaving the washer will always be nearly saturated and located close to point *2* to satisfy all practical requirements.

However, if the air enters the washer at a dry bulb temperature represented by point *4* which is to the right of the vertical line of 50 F dry bulb temperature, the steam supply to the water heater will immediately be throttled because the water need not heat the air. The water needs only to supply a *part* of the latent heat needed to evaporate the moisture into the air; the balance of the latent heat is supplied by the cooling of the air itself because the thermostat will throttle the supply of steam until the air leaves at a temperature of 50 F. In this case, the water temperature will be lowered sufficiently by the dew point thermostat so that the air will be cooled and humidified along a curve like *4-5-6*. The air entering the washer at point *4* leaves in the condition represented by point *5* along the vertical line of dry bulb temperature corresponding to the 50 F setting of the dew point thermostat.

If the air entering the washer is preheated to a point like *7*, the thermostat will cut the steam off completely because in this case the air passing through the air washer will be cooled to point *8* which also lies on the line of 50 F dry bulb temperature without any steam being supplied. In this case the air in cooling back to the 50 deg setting of the dew point thermostat surrenders all the latent heat needed to evaporate the moisture—that is, the air is cooled adiabatically along the line of constant wet bulb temperature *7-8-9*.

Notice that as long as the dry bulb temperature of the air entering the washer is above the setting of the dew point thermostat, the dew point temperature of the air leaving the washer is lower than 50 F. Points *5* and *8* represent the final condition of the air when its initial dry bulb temperature is above the setting of the dew point thermostat; that is, the points representing the initial condition of the air lie to the right of the vertical line of 50 F. Notice that at points *5* and *8* the air is unsaturated and the dew point temperatures at these two points are below point *2*. For any initial dry bulb temperature higher than the setting of the dew point thermostat, the dew point temperature of the air leaving the washer cannot be controlled. Consequently, if the dew point temperature of the air supply is to be maintained at a nearly constant point, the dry bulb temperature of the air entering the washer must always be lower than the setting of the dew point thermostat.

If the wet bulb temperature of the air entering the washer is higher than the wet bulb temperature at point *7*, the steam will remain off and the humidifier will function as a simple washer. In this case both the dry bulb temperature and the dew point temperature of the air supply leaving the washer will always be higher than these temperatures at point *8*. There can, of course, be no control of humidity from the dew point thermostat in this event.

It should be noted that as long

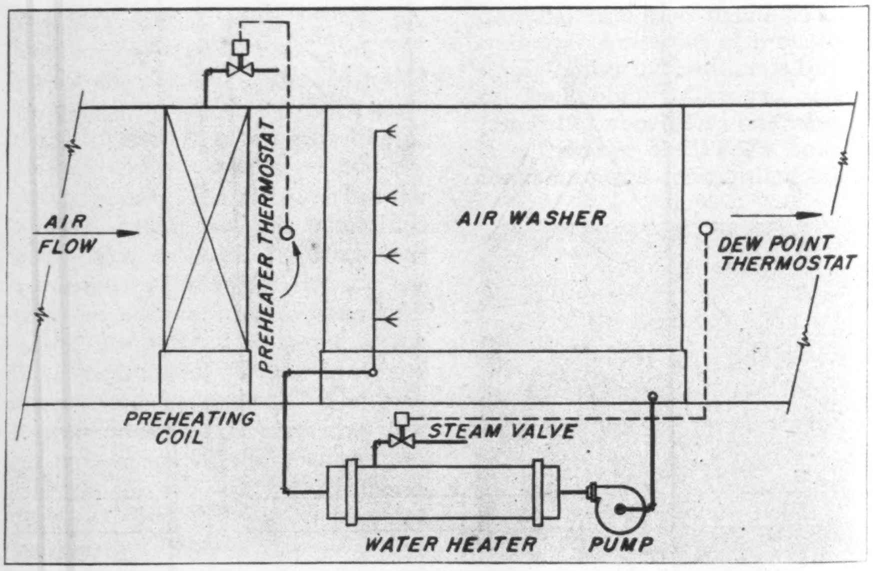


Fig. 27—Dew point control of humidity when water circulated through air washer is heated

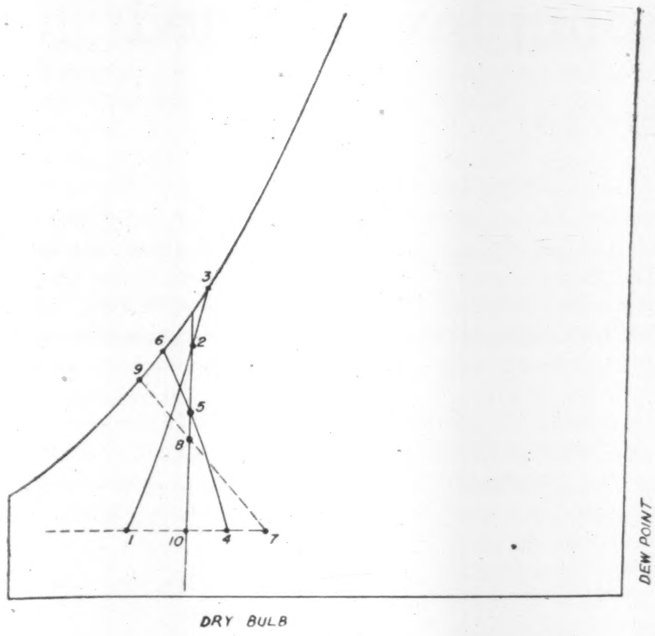


Fig. 28—Psychrometric chart illustrating the humidifying cycle for the apparatus shown in Fig. 27

as the dry bulb temperature of the air entering the washer lies between points *9* and *7*, the dew point temperature of the air leaving the washer will lie between points *2* and *8* along the vertical line of 50 F dry bulb temperature. The closer the temperature of the air is to point *7*, the closer the dew point temperature will lie to point *8*. However, if the dry bulb temperature of the air supply is higher than point *7*, the dew point temperature of the air supply will continually rise as the dry bulb temperature of the entering air supply increases. The limit to which the dew point temperature of the air supply can rise in this case depends only upon the highest dry and wet bulb temperature at which the air enters the washer, just as in ordinary uncontrolled washers.

Control of Outdoor and Return Air Dampers

With the type of dew point control illustrated in Fig. 27, the thermostat controlling the temperature of the air entering the washer must not only control the preheating coil, but must in addition control the outdoor and return air dampers so that the dry bulb temperature of the mixture entering the washer will always be lower than the setting of the dew point thermostat. If the return air and outdoor air dampers are not controlled, quite frequently the dry bulb temperature of the mixture may be too high, with the result that the dew point temperature of the supply air will go out of control.

In systems in which a large amount of return air is used, it may not be possible to keep the temperature of the mixture entering the washer at a low enough point to permit the dew point control to function properly. It is probable that a low enough mixture temperature to insure satisfactory control will not be obtained except at low outdoor temperatures. If this is the case, a careful investigation should be made to be sure that no humidification and no humidity control will be needed at the higher outdoor temperatures for which the temperature of the mixture will be above the setting of the dew point thermostat. If so much return air is used that even with low outdoor temperatures the temperature of the mixture entering the washer is too high, over-humidification may result—which may be objectionable because of window condensation. If a large proportion of return air is used, it may be necessary to humidify only the stream of outdoor air and to place the dew point control in the stream of outdoor air. In this manner, conditioned spaces can be humidified even though the dew point temperature of only the outdoor air supply is controlled. Such control is usually satisfactory for buildings in which there are no important sources of internal moisture gain during the winter and the moisture losses are always larger than any possible gains.

Preheaters under control of an outdoor air thermostat raise particular havoc with this type of dew point control. Two banks of preheater coils are frequently provided. The admission of steam to the first bank is controlled by an "on-and-off" thermostat set at about 35 F in the path of the outdoor air. This thermostat turns full steam pressure into the first bank of preheaters whenever the outside air temperature drops below 35 F. The second bank of preheaters is, of course, controlled from a modulating thermostat in the path of the air just ahead of the air washer. The first bank of preheaters is usually of sufficient size so that at the lowest entering air temperature, the air leaving the first bank will be above 32 F. Thus, if the lowest temperature is —10 F, a one-row coil of the type commonly used would heat the air to a final temperature of about 45 F. However, if the outside temperature is only 30 F, this same coil would heat the air to 76 F. Under these conditions, even with all outside air or with a mixture of outdoor and return air, no control of the dew point temperature of the air supply would be obtained if the dew point thermostat were set at the commonly used temperature of about 50 F. With this type of dew point temperature control, it is particularly important that no on-and-off coils be used on the air supply and that the temperature of the mixture of return and outdoor air entering the washer be controlled at a point lower than the setting of the dew point thermostat.

Use Reverse Acting Valve

Note that when steam is used to heat water for the humidifier, and a pneumatic steam valve is used for control, a reverse acting valve should be installed. In case of failure of air pressure in the control lines, the reverse acting steam valve will close. If a direct acting valve were installed, the steam valve would open wide on failure of air pressure, resulting in possibly disastrous over-humidification.

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Graphitization of Piping Investigated

By H. N. Boetcher

Following the discovery of graphitization in a carbon-molybdenum pipe at Springdale station, we made an extensive survey of the piping of the Westport superposed unit after 22,000 to 23,000 service hours and an exploratory survey of the piping of two condensing units, which had been in service for shorter periods of time. The throttle steam temperature of all these units is in the neighborhood of 900 F. A second survey of the piping of the superposed unit was made after about 29,000 service hours. In connection with the examinations, samples of the Springdale piping were also examined. Furthermore, a number of specimens of Springdale and Westport pipe have been examined after exposure to 1100 F for about 7000 to 7500 hr. Further work is under way with heating tests at 1125 F, and a cooperative program has been set up with a pipe manufacturer for a thorough investigation of large size pipe made from special experimental heats.

Service Graphitization

No graphite was found in the piping of the condensing units. We contemplate taking supplementary sets of specimens after these units have had longer service.

Most of the samples were taken by "weld prober." The sampling of the piping of the units covered castings, forgings, pipe of steel killed with about 0.5 lb of aluminum, pipe of steel killed with about 1.0 lb of aluminum, and pipe of steel killed with 1.5 to 2 lb of aluminum per net ton. No graphite was found in any casting, such as the header and valve bodies. A trace of graphite was found in a forged ell. Traces were found also in one each length of pipe killed with 0.5 and 1.5 to 2 lb of aluminum, respectively. All of these were located in the "critical zone," near welds. Fairly heavy graphitization was found in one length of pipe of high aluminum-killed steel, but none of it was of the "plate type" prevalent at Springdale. It should be noted that, with the exception of one piece of pipe, the amounts of graphite found were minute and that many pieces of pipe of both low and high aluminum-killed steel were in series with these lengths, but did not show any graphite.

A thorough examination of the one exception, pipe "1-17," which was replaced after 29,000 service hours, is under way. Graphite was found in this length in concentrated form in the "critical zones" near the two welds and dispersed throughout the length of pipe. A comparison of the conditions found after 23,000 and 29,000 service hours, respectively, is difficult since the amounts vary considerably even within any one specimen. We feel fairly certain that the amount of graphite dispersed throughout the pipe increased appreciably, but are not certain of appreciable increases in the "critical zones." An idea of the extent of graphitization experienced in the pipe proper is given by chemical analyses which showed graphite contents of 0.024 and 0.029 per cent, respectively, in two samples with a total carbon content of 0.118 per cent. This indicates that over 20 per cent of the carbon has been graphitized.

GRAPHITIZATION

Since the failure last year of a large carbon-molybdenum pipe carrying high pressure, high temperature steam at a central station power plant, there have been and are being carried on a number of investigations on graphitization of piping, to which the failure was attributed. One such investigation was described in a paper by Mr. Boetcher (assistant to the superintendent of power production stations, Consolidated Gas Electric Light and Power Co. of Baltimore) presented at an informal session held during the 1944 annual meeting of the American Society for Testing Materials and published in the October 1944 ASTM Bulletin; excerpts from this paper are given here. . . . A brief summary of other information on graphitization, and suggested maximum operating temperatures for various pipe materials, appeared on pages 591 and 592 of the October 1944 issue of HPAC

Tentative Conclusions and Experimental Work

No conclusions have been reached, as yet, regarding the conditions which make a steel basically susceptible to graphitization. In agreement with others, we found that steels showing appreciable service graphitization had relatively large amounts of metallic aluminum (above 0.003 per cent), but not necessarily much aluminum oxide. The effect of normality of the steel on susceptibility to graphitization is being kept in mind. All tests made so far showed the pipe steels to be abnormal, regardless of whether they graphitized in service or not. If it is true, therefore, that abnormal steels are susceptible to graphitization, other factors must determine whether graphitization will actually occur or not.

One factor which, in our opinion, is definitely of importance is the microstructure of the steel. A review of photomicrographs seems to show that graphitization takes place only in coarsely spheroidized steel. This is shown in a number of photographs which frequently include individual spheroids in a stage of incipient graphitization. It is not necessary that the entire steel or even the entire carbide grain has been spheroidized. These findings are in agreement with a statement by Prof. A. E. White according to which a "lacy" structure favors the development of dispersed graphite throughout the pipe and a Widmanstätten structure, in spite of fine spheroidization in heat treatment or service, suppresses graphitization, but leads to sharply accentuated and concentrated graphitization in the narrow, coarsely spheroidized critical zone near a weld. In our observations, a pearlitic structure also obstructs the development of graphite, though not as rigidly as a Widmanstätten structure, probably due to the presence of some spheroidal carbides in most pearlitic grains.

The importance of the microstructure makes it appear necessary to consider the results of accelerated graphitization tests at temperatures above the range occurring in service, on the basis of the possibilities of changes in microstructure which would not occur at service temperatures within the length of normal service life. We do not believe that enough information is available, or has been coordinated, on this important item at present. Our own tests at 1100 F do not offer conclusive results on this point. It seems that the coarse spheroids which initiated service graphitization in the critical zone at welds or in the pipe proper were present when the piping went into service. We are, however, aware of the fact that many factors other than spheroidization are involved as indicated also by the reported decrease in rate of graphitization above 1100 F in spite of the increased trend toward spheroidization.

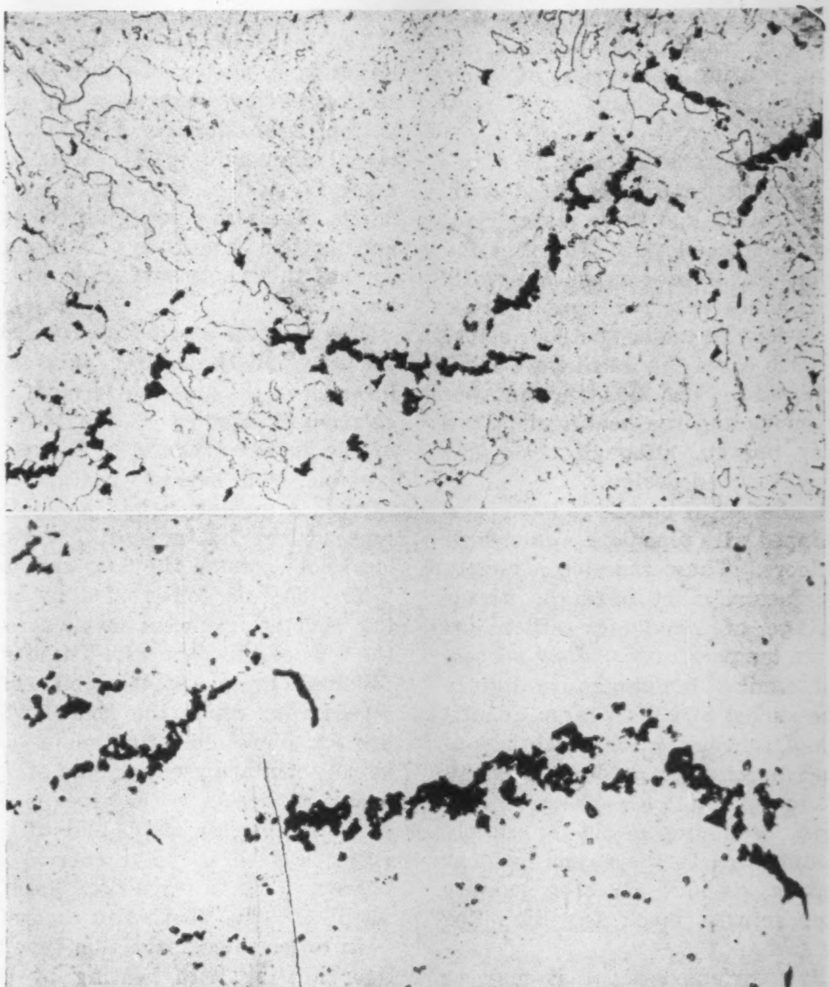
Regarding experimental work, we completed and are now analyzing a test run at 1100 F for 7000 to 7500 hr. We contemplate and are preparing future work in which the experiences of the first test will be considered.

Though, as a result of our failure to protect the specimens from free access of air, many of the specimens tested at 1100 F were badly decarburized, a few significant results were obtained. The test had two purposes. One was to investigate, at a possibly accelerated rate, the progress of graphitization already started in service. The second was to investigate certain factors then thought to be of importance.

The investigation of the progress of graphitization already started was probably affected by the decarburization which deprived the steel of carbon which otherwise would have been available for the formation of graphite. Decarburization did not seem to remove any of the relatively stable graphite itself. The sample of pipe "1-17" used in the heating test was removed from service after 22,171 hr. It should be noted, however, that there is no trend whatsoever toward development of the plate type graphite such as found at Springdale. In this connection it is of interest that the effect of the *dispersed* type of graphite in the relatively concentrated form in the "critical zone" of pipe "1-17" on the physical properties is negligible. Bending tests show no cracking even when enough graphite was present to produce visible "eyebrows" as was the case in "1-17" after 29,000 service hours. Tension impact tests with specimens including the weld with appreciable lengths of pipe at both sides showed ductile failures, with average energy consumption of 107 ft-lb, in the pipe at either side of the weld, but nowhere near the lines of graphite. For comparison, a similar specimen of Springdale pipe had a brittle fracture in the "critical zone," with 18 ft-lb.

Samples of a piece of pipe killed with 1.5 to 2 lb of aluminum were heated to 2000, 2050, 2100, and 2150 F, respectively, then welded and kept at 1100 F for 7000 hr. On examination, the sample heated to 2150 F definitely showed "eyebrows" in the critical zone. All of these specimens developed graphite in the critical zone, but not in the pipe proper. A trend toward concentration of the graphite in the critical zone with increasing temperatures of heat treatment is suggested.

Top—Graphitization in carbon-molybdenum steel pipe in critical zone next to weld after experimental heating at 1100 F for 7000 hr. Steel normalized at 2150 F (X 200). . . . Bottom—Graphitization in critical zone next to weld in service at Springdale station. (X 750)



Letter from England

Leslie Rayner Writes of Tests on a Method of Floor Heating

LONDON, ENGLAND

PANEL HEATING with hot water has been very widely used in England and all possible dispositions of panels have been tried. The ceiling has been the most favored position as being almost free from the possibility of obscuration of the radiant heat. This ceiling heating is admirable in multi-story buildings where heat leakage upward through floors provides a measure of floor heating. But in single story buildings, it has been found that ceiling panels do not always produce comfortable conditions in that there is a possibility of cold feet. A great deal depends upon the floor construction. It has been found that there are single story buildings in which the occupants sit at desks where cold feet will definitely result with overhead radiant heating; examples of such buildings are schools and post offices.

A considerable number of English schools have been fitted with floor heating and three main types have been employed. The first installations were carried out with 2 in. diameter pipes, run in brick ducts formed under the floor slabs. In some cases the ducts were filled with sand. The construction was expensive and the heating in some cases uneven, although the cause was often bad design.

A number of buildings have been equipped with pipe panels embedded in floors. These function perfectly satisfactorily but have the disadvantage of requiring rather low water temperatures. Many schools and similar buildings are lightly constructed and need large quantities of ventilating air which is supplied direct from outdoors through windows. In such cases it has often been impossible to supply enough heat to the rooms by floor heating without reaching surface temperatures much too high for comfort.

For various reasons it may be desired to confine floor heating to parts only of the building. A logical choice for the remainder is hot water radiators and these may also serve as supplementary heating in floor heated rooms. Immediately there arises the necessity for hot water at two different temperatures which increases complication in the boiler house. In addition, two flow mains are required throughout the building although a common return main is permissible.

It is thus apparent that a method which enables hot water at normal temperatures to be circulated has advantages. The third type of floor heating was developed by the makers of a floor of sawdust-concrete composition, which forms a splendid covering for this type of heating.

The main feature of the installation is a heater of "dumb-bell" section having waterways top and bottom approximately 1 in. in internal diameter. The heaters are made in steel of any length up to 28 ft. The web connecting the top and bottom waterways is hollow so that the whole surface is water backed.

The floor is carried on concrete sleepers and the heater units are inserted in the ducts so formed. Insulation is applied to the bottom of the ducts to reduce, so far as is possible, heat losses to the ground. Strips of insulation laid along the tops of the heater units prevent local hot spots on the floor surface.

The floor is constructed by laying concrete panelled slabs across the tops of the sleepers. These are followed by a cement and sand screed into which the floor blocks are set. Flow and return mains are usually run along either side of the room. If access to the pipes is desired the flooring at the side of the room is fixed in trays carried on bearers. The finished floor level is about 12½ in. above site concrete.

In order to compare this type of floor heating with heating by hot water radiators, tests were run in specially constructed buildings. There were two rooms identical in dimensions and materials; the construction was 4 in. wood framing, sheathed with 24 ga corrugated steel outside, and lined with ½ in. insulation board inside. The roof was of galvanized steel with an insulation board ceiling. Floor construction was solid concrete in the radiator equipped structure.

Room "A" was equipped with the special heating elements described above. The total surface area of the elements was 159.8 sq ft. Standard radiators were used in "B," their heating surface plus that of exposed piping being also 159.8 sq ft. Underfloor mains and connections had equal heating surface in both cases.

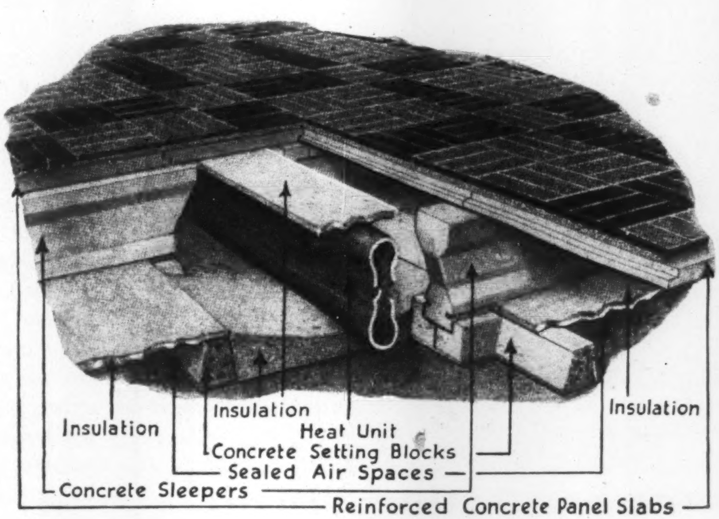
The elements and radiators were supplied with hot water from individual cylinders, each of which was fitted with electric immersion heaters. Water flow temperature was regulated by a thermostat at the top of each cylinder controlling the immersion heaters. Energy input to each room was read on a standard meter. All circulating pipes were insulated.

Temperatures were measured by mercury in glass thermometers.

FLOOR HEATING

Low temperature radiant heating has been widely used in England, and practically every possible disposition of the panel heating surfaces has been employed. One scheme, developed by the makers of a floor construction, involves use of heating surfaces of "dumb-bell" cross section through which hot water is circulated. This heating surface is installed in duct spaces in the floor. With a mean water temperature of 160 F, the air temperature in the subfloor is 100 to 110 F and the surface temperature of the floor is around 75 F. Heat emission is about 300 Btu per lineal foot of the "dumb-bell" surface, about 270 Btu of which reaches the room. . . . Mr. Rayner gives here some test results on two identical rooms, one heated by the method described and the other heated by conventional hot water radiators

The results are therefore not without objection since these instruments do not register equivalent thermal conditions. It would have been better to use a eupatheoscope and record the test results on the equivalent temperature scale. It is probable that the equivalent temperature may be accepted as approximately equal to the air temperature for radiator heating but in the case of floor heating, the equivalent temperature will range 2 to 5 F higher than the air temperature.



Hot water is circulated through the "dumb-bell" sections installed in ducts in the floor construction

The first test illustrated the time lag inevitably introduced by the necessity to warm the mass of floor before floor heating becomes effective. Heat input was controlled by room thermostats. The rooms were left unheated for 16 days in severe winter weather. Using the temperature at the 3 ft level as an approximate index of comfort, it was found that the radiator heated room was comfortable 6 hr after the commencement of the test, while 12 hr was needed to attain comfort conditions in the floor heated room. The test was run for 168 hr, when it was found that the heat inputs had been 3,969,240 Btu for radiator heating and 3,229,270 Btu for floor heating, showing a saving of 18½ per cent in favor of floor heating. It may be objected that room "B" was usable 6 hr earlier than room "A" but this objection is invalid, for the thermal capacity of the floor would enable room "A" to be used for some hours after room "B" was too cool for comfort.

The second test was indicative of the results to be expected with continuous heating. The rooms were brought up to the same temperature and the room thermostats set to cut in at 58 F and out at 60 F. The test was run for 60 hr and the results showed that floor heating required less heat input, the saving being about 10 per cent.

The third test was indicative of results to be obtained in practice when heating is shut off at night. Both rooms were kept at constant temperature for two days, heat being cut off at 4 p.m. on the day prior to the test. Heat was put on at 8 a.m. on the test day and cut off again at 4 p.m. The salient feature of the test result was the slow cooling of room "A," the temperature at the 3 ft level dropping 4 F in 4 hr. The reduction in energy consumption for floor heating was about 7 per cent in this case.

Windows were kept shut during the experiments and it may be assumed that infiltration would be of the same order in both rooms. Room "A" had a slightly more severe exposure than room "B."

Measurements have been made of the heat output of the unit and it is found that with a mean water temperature of 160 F, the emission is about 300 Btu per hr per lineal ft. This results in an air temperature in the subfloor of about 100 to 110 F. The surface temperature of the floor is then 75 F. Of the 300 Btu emission, about 270 Btu reaches the room. The latter figure is used for design purposes to ascertain the total length of unit to be installed. Heat losses for design are computed in the normal way.

ACRMA ESTABLISHES FIVE SECTIONS

Anticipating a tremendously increased market for the industry in the postwar period, the Air Conditioning and Refrigerating Machinery Association has inaugurated an aggressive expansion program. Five sections have been established, each dealing with a particular phase of the business, covering room coolers, self-contained air conditioning units, small compressors and condensing units, large compressors and condensing units, and central station air conditioning and refrigeration equipment. Under the new setup, the association plans to continue its program of technical standardization work.

Application in the war industries has advanced the science of air conditioning by many years, it was declared by ACRMA members at the association meeting held in Hot Springs, Va., last month. As a result, air conditioning as a whole has gained great impetus, not only in industry but also as applied to the home.

The headquarters office of the ACRMA is at 717 Southern Bldg., Washington 5, D. C.

WSE MARKS 75TH ANNIVERSARY

The Western Society of Engineers marked its 75th anniversary by a celebration held on December 5. Founded in 1869, it is said to be the third oldest engineering society in the United States.

The purpose of the WSE, as defined in its constitution, is the advancement of the theory and practice of engineering, the improvement of the status of engineering practice as a profession, and the maintenance of high professional standards. It represents all branches of the engineering profession, and among the society's membership are representatives from practically every type of business organization and institution of the nation.

SAM LEWIS' PAGE

Operating Engineer Puzzled by Disappearing Boiler Water

OCCASIONALLY a curious steam heating problem appears. Here is one. The bewildered operating engineer reported as follows: A low pressure steam heating system with an internal furnace boiler is burning oil. Every little while the water in the boiler disappears and the low water cutout switch opens the oil burner motor circuit and trouble follows. Eventually the water returns and floods the receiver and it becomes necessary to waste some of it through the blowoff to the sewer. This involves waste of fuel and much extra bother to the engineer.

The answer was that no sight-unseen diagnosis of such a case could be made and an inspection became necessary. The inspection of the plant disclosed the following:

The relatively small two-story manufacturing plant requires steam for heating and not for process work. The steam and return mains are parallel, and overhead pipe coil radiators above the mains serve the first story. There are several first-story unit heaters, the return connections of which are lower than the return mains. On the second story there are many radiators and five unit heaters all above the first story mains.

Originally this heating system was a single-pipe steam plant, very poorly designed, with the two major steam mains each over 100 ft long and three branches each over 50 ft long, all pitching up from the boiler header to their remote ends. The radiators had single pipe connections and automatic air valves. Later, some unit heaters, with separate return pipes to a float-controlled electric condensate pump, were added. Float traps were installed on the return outlets of the unit heaters. This scheme, being of exceedingly doubtful pedigree and character, did not work well, so the engineer decided to convert it to a two-pipe system. He ran new overhead return mains, paralleling the steam mains, but did not change the direction of drainage in the steam mains. He connected the radiators and unit heaters through various types of traps to the new return main and installed a thermostatic air vent to the atmosphere outdoors from the receiver of the condensate pump. This vent has a small port.

Unfortunately, the drainage connections from the steam mains to the new return mains are only ¾ in. in diameter, without sediment pockets or drainage legs, and are not at the ends of any of the mains or major branches but about halfway between the boiler and the ends of the mains. He installed a ¾ in. pipe from the boiler steam header running through a check valve to the receiver of the condensate pump.

Cause of the Trouble

If the boiler pressure is less than about 10 psi, the water boils out of the boiler and does not return, necessitating adding city water in order to keep the oil burner running. (Otherwise the low water switch stops the oil burner motor.) Evidently the condensate refuses to run back through the steam main in opposition to the rather rapid countercurrent of steam and accumulating in the steam mains near their distant ends, seals off the flow of steam to certain radiators or heat transmitters. These devices, not receiving steam, cool rapidly and develop very low internal pressure, called induced vacuum, and will fill with water either through the water-sealed supply branch or through the return trap. This water soon is missed in the boiler.

The steam header drain described above gives a short circuit for boiler pressure to be felt in the receiver of the condensate pump, thus nullifying the desired and necessary differential pressure between the supply main and the return main. Without such a differential pressure, there is no incentive for the falling condensate to break the induced vacuum in the heat transmitters.

The diagnosis having been made, a prescription is in order. The treatment must be in stages, a complete emergency operation not being practicable at this late date:

1) Remove the alleged header drain from the boiler steam header direct to the condensate pump receiver. Replace it with a drain connection from the header to the existing pump discharge pipe between the pump and the boiler. This will drain the header and will allow the pump to create the differential pressure for which it was designed.

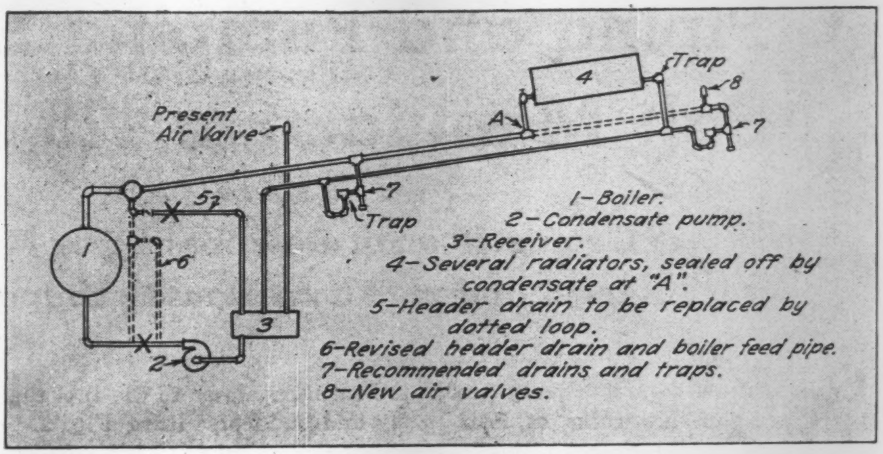
2) Install at each of the five ends of the mains a good sized condensate-collecting leg, each with a float trap draining without lift into the return main, and install similar legs or reservoirs with larger traps than those originally installed at the two critical intermediate drainage points in the steam mains.

3) Install near the five ends of

In this regular feature — a page more or less in length — informal comment on heating, piping, and air conditioning problems and their solutions is given — at the request of the editors — by Samuel R. Lewis, consulting engineer, and a member of HPAC's board of consulting and contributing editors.

the steam mains adequate automatic air valves to permit escape of the air out there rather than making it fight its way all of the long journey back to the receiver.

4) Next summer regrade the steam mains so as to pitch down away from the boiler rather than to pitch up, and then remove the air valves and install a vacuum pump so that in mild weather heat may be transmitted economically at subatmospheric pressure and modulated temperature considerably below 200 F rather than at the present lower limit of 230 F.


Present Air Valve
Trap
4
8
A
7
5
7
Trap
1
6
3
2
1—Boiler.
2—Condensate pump.
3—Receiver.
4—Several radiators, sealed off by condensate at "A".
5—Header drain to be replaced by dotted loop.
6—Revised header drain and boiler feed pipe.
7—Recommended drains and traps.
8—New air valves.

Watch Flue Gas Temperature for Fuel Burning Efficiency

By Joseph Harrington, Advisory Engineer

ONE OF THE largest losses in the boiler room is the heat which passes up the stack with the flue gases. With well designed boilers this amounts to 10 per cent and in poorer settings may go up to 30 per cent. The gas temperature is not the complete index of the loss. It is necessary to keep down the volume or weight of the gases by watching the CO_2. The temperature indication, however, is very illuminating and shows certain things obtainable in no other way.

Soot accumulates on the tubes constantly and shows an effect on the flue temperature in a few hours. After the tubes have been cleaned the temperature will drop an appreciable amount, frequently as much as 50 deg. The temperature will then gradually rise until at the end of eight to 12 hr it will have regained its former degree. The extent and rapidity of this increase is largely, if not entirely, dependent upon furnace conditions. It is much more rapid with smoky furnaces and the incomplete combustion consequent upon irregular hand firing or excessive rates of combustion. For every 100 F rise in temperature a loss of 3 per cent is suffered.

Another valuable feature of this temperature is in showing whether a hole has developed in a baffle. With a high stack temperature and a low draft loss in the boiler, attention should at once be given to the tightness of the baffles, a hole producing just these effects.

A study of flue temperature is most interesting when taken in conjunction with the draft losses and gas analysis, soot blowing periods, and the general internal cleanliness of the boiler. A scale deposit inside the tubes also has an insulating effect and should properly be included in the causes affecting flue temperature. Inasmuch as stack loss is one of the heaviest suffered in the boiler room, nothing bearing on it can be considered superfluous. A recording instrument should be in every plant. It can be moved from boiler to boiler and a study made of each in conjunction with CO_2 and draft. Give the fireman a ruled sheet for his record and see his interest develop.

Three-dimensional plan of the 4057 acre, $71,636,715 Idlewild airport, planned for construction near New York City, to be the largest in the world, released in October. Shown is the $7,500,000 administration building surrounded by three hangar groups to house and repair planes of principal airlines. At lower left is a tank farm for gas and oil, and at lower right a seaplane base. Light lines show the "tangential" runways

Piping and Pumping Systems for Salt Manufacture 125 Years Ago

George Holman Describes Pipes Made of Bored Logs, and a "Thorn House" Evaporative Tower

ONE HUNDRED and twenty-five years ago the salt works of Half Moon Lick on the Saline river in southern Illinois was one of the largest industrial establishments west of the Atlantic seaboard. Salt sold for five dollars a barrel wholesale, and as high as 16 cents a pound retail. Scores of indentured servants made 10 to 100 bushels of salt daily at a half-dozen furnaces, such as that shown in Fig. 1. Kettles held 50 to 100 gallons, and there were as many as 30 to a furnace.

As timber was plentiful, wood was the fuel used to boil down the brine. Large numbers of trees were cut by woodchoppers and hauled or dragged to the furnaces by teamsters using their own horses or mules. Due to rapid exploitation, the trees near the saline springs were soon cut off. The cost of hauling wood to the furnaces over a stumpy clearing became excessive, and the lessees of the works from the state were compelled to move the furnaces closer to the fuel supply and build pipe lines, Fig. 2, to carry the brine from the springs to the new furnace locations.

In order to move the brine, hoisting stations were built. The hoisting apparatus consisted of dip buckets on a conveyor belt or chain. In later years they were driven by a horse by means of a tumbling shaft. Still later, steam driven pumps were installed. But for a half-century a hoisting cistern was operated by a crank turned by a man standing on a platform. The countryside was flat, however, and a 30 foot head sufficed to carry the brine over the highest parts of the line. A hoisting tower is shown in Fig. 3.

Fig. 4 shows the common method used to make pipe from trees of about 10 to 15 inches diameter. A common bore was 4 inches. Fig. 5 shows the method of putting the sections of pipe together to form a pressure tight joint. There was no allowance for expansion, each pipe line stretching across country in a straight line. Once saturated with brine and swollen, the pipe joints seldom leaked.

Fig. 6 shows one design of a "thorn house." This was really an evaporative tower and was used to save fuel during the hot summer months when the teamsters and woodcutters were away at work on their claims. Few modern cooling towers are as large as one of these is known to have been. The mere presence of such a tower is ample proof that the engineers of that day were much better acquainted with the laws of physics than modern engineers perhaps think.

One authority has estimated that prior to 1850 as much as 100 miles of pipe lines had been constructed at the salt works, every inch of it made of wood. Considering the tools and raw materials available, these lines were as large and as wellbuilt, and as much the product of engineering ingenuity, as any pipe line of modern times.

SEE OPPOSITE PAGE

Fig. 1—General design of a furnace. A trench was dug and lined with sandstone. A chimney 20 to 100 feet high was built of logs at one end of the trench, plastered inside with mud and sometimes flash-walled with sandstone. Kettles, as many as 30, were set over the trench and the spaces between them sealed with mud and stone. The furnace was of the dutch oven type, often of sandstone but sometimes of arched brick, and with grates. Brine was placed in the kettles nearest the fire first. As it boiled down, it was moved into kettles nearer the chimney by dipping with a large, long-handled dipper. Final boiling took place in the drying pan, *P*, out of which the salt was scooped to the drain boards *B*, *B*. Parallel flow of brine and hot gases was necessary to prevent burning the kettles nearest the fire

Fig. 2—The "Big Inch" of the Illinois salines. Several of these 4 inch pipe lines, some five miles long, carried brine from the saline springs of Half Moon Lick to evaporating furnaces in the vicinity. Stakes, *s*, and cast iron weights, *w*, were used to keep flood waters from lifting and damaging the lines. Each section was a log bored lengthwise, reamed at one end and tapered at the other, and 15 to 20 feet long

Fig. 3—A "h'isting cistern," where brine was started on its way

Fig. 4—Pipe was manufactured in the field—or rather, in the woods. A 4 inch auger was used, operated by manpower. To check for trueness of the bore, the chain tongs were released, and the log rolled back and forth. If the auger handle wobbled, the auger was "running out"

Fig. 5—Pipefitting at Half Moon Lick in 1820. Oakum, lead, and the running snake now used in laying soil pipe were almost unknown at the salines. The tripod was used, but not to support a vise. Instead, it held up the battering ram which was used to drive the pointed end of one section of pipe into the tapered reamed end of another. Bands of iron, *b*, shrunk on the bell end, kept the large end from splitting

Fig. 6—The evaporative tower, now widely used as an economical means of waste heat disposal, was used effectively to save fuel by increasing brine concentration prior to boiling off at the Illinois salines. The entire structure was of wood. Brine was "h'isted" from a cistern at one end, and carried the length of the tower by a distributing trough made of hollowed half-logs or boards. It was then permitted to fall through thorn bushes, in lieu of screens. Hence the common name of "thorn house"

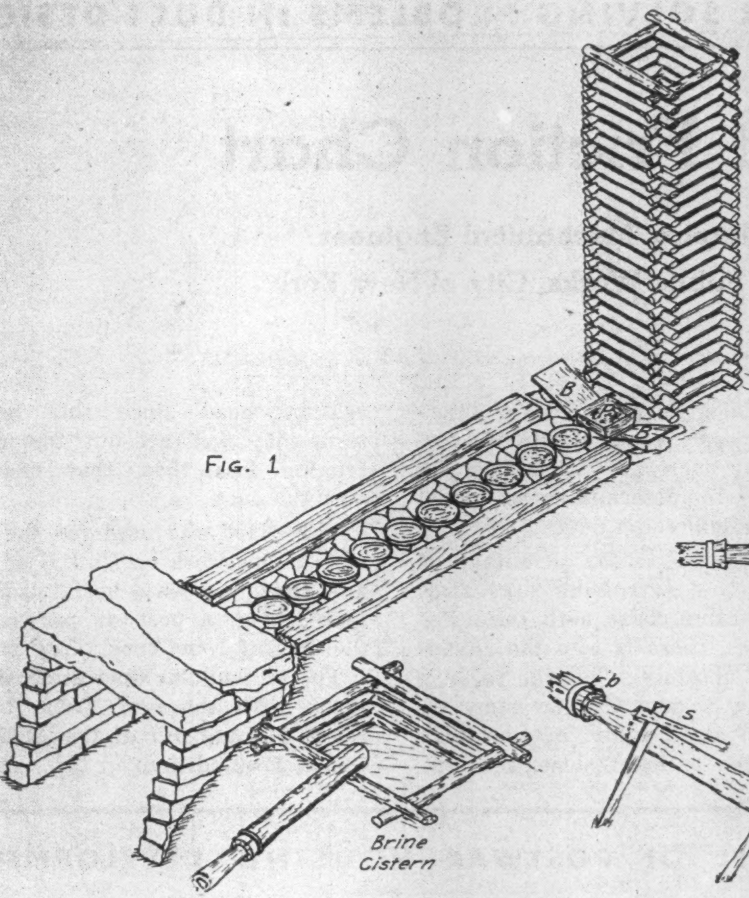


FIG. 1

B
Brine
Cistern

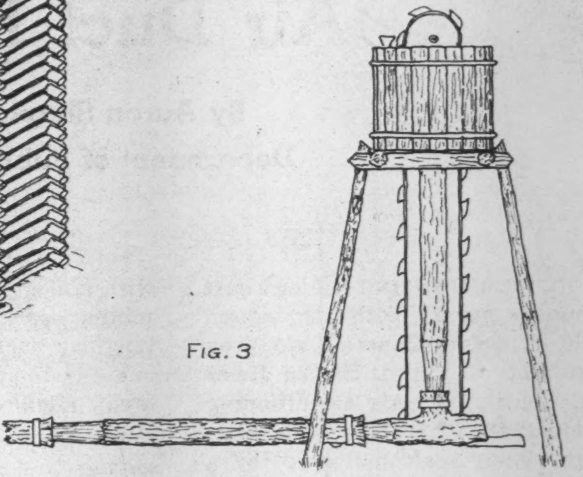


FIG. 3

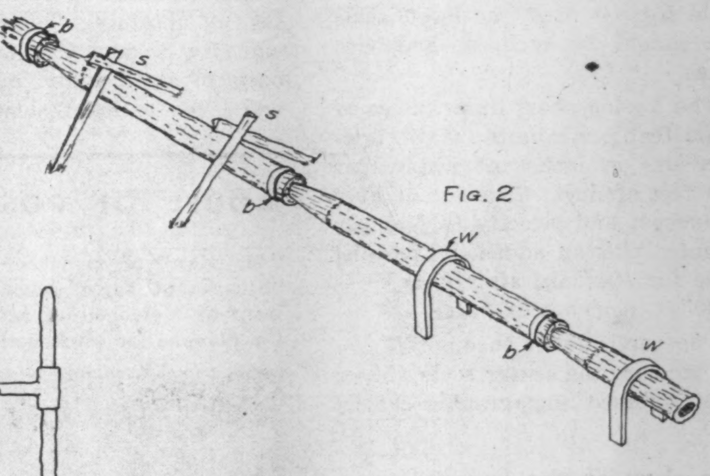


FIG. 2

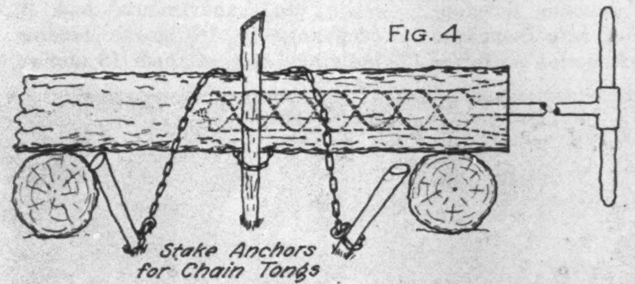


FIG. 4

Stake Anchors
for Chain Tongs

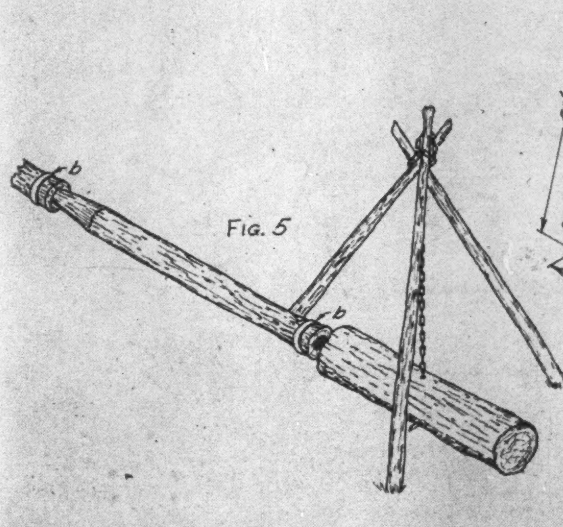


FIG. 5

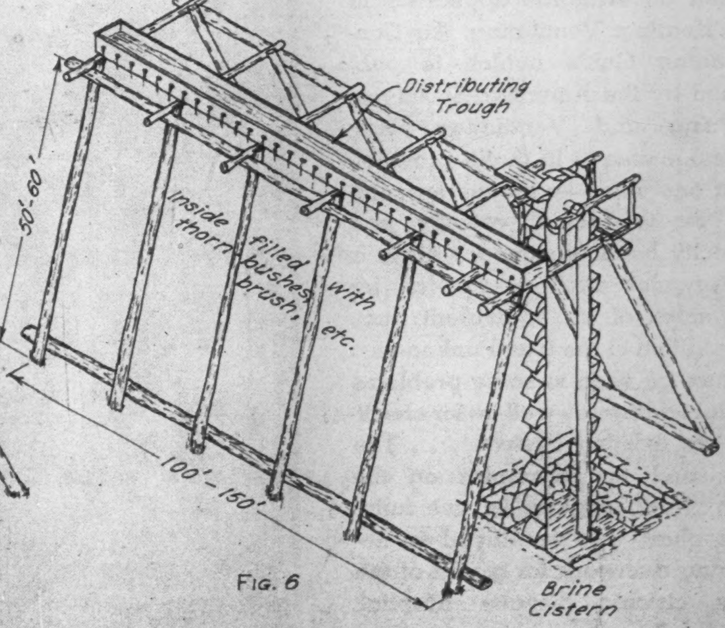


FIG. 6

Distributing
Trough
50'-60'
Inside filled with
thorn bushes,
brush, etc.
100'-150'
Brine
Cistern

HERE IS A NEW CHART FOR SOLVING PROBLEMS IN DUCT DESIGN

Air Duct Friction Chart

By Aaron Shapiro, Mechanical Engineer
Department of Public Works, City of New York

THE ACCOMPANYING log-log chart (opposite page) with its bottom scale H_{s1} solves Equation No. 4 on page 611 of the ASHVE's Heating, Ventilating, Air Conditioning Guide 1942. The upper scale $H_{s1.1}$ is the lower scale multiplied by a factor of safety of 1.10, as recommended by the Guide. If the upper scale $H_{s1.1}$ is used, the lower scale H_{s1} should be ignored, and vice versa.

The log-log chart links values of cubic feet per minute; static friction loss in inches of water, per 100 feet of duct; diameter of duct in inches; and velocity in feet per minute; plus an additional parallel scale for standard air: $H_v = V^2 \div (4005)^2$ in inches of water.

The vertical line through $H_{s1} = 0.3$ becomes the center scale (5) of two combined nomographic charts, with scales (1) and (2) for determining an "equal friction" rectangular duct and with scales (3) and (4) for determining an "equal area" rectangular duct.

In addition to the advantage of having the rectangular duct sizes on the same chart with the other variables, there is also the advantage of obtaining the true velocity and, for a duct having many elbows of small radius of curvature and large ratio of sides, the true velocity head—since this latter term may well account for more friction loss than that of the straight duct.

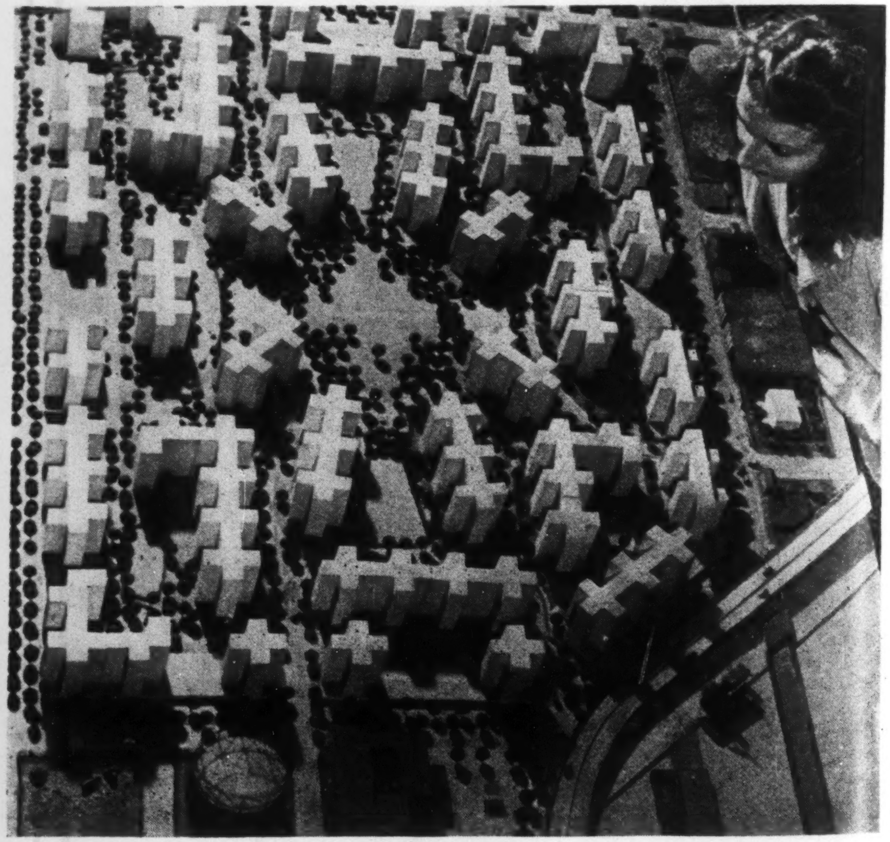
The chart was used for the design of ductwork on Unit B of the new chronic disease hospital, Welfare Island, a postwar project of the City of New York.

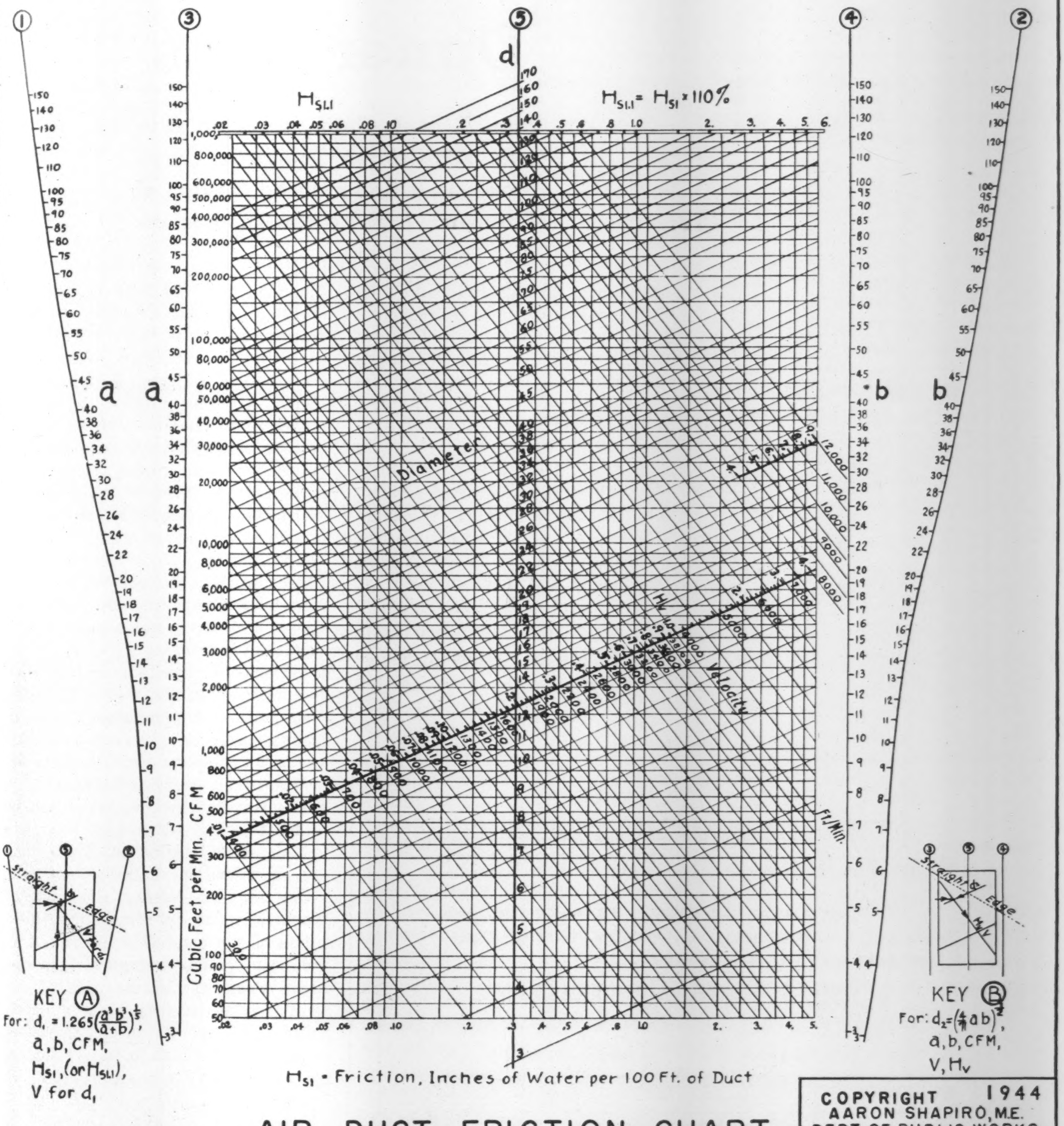
The rectangular duct dimensions check with those of Table 1 on pages 616 and 617 of the ASHVE Guide, 1942 edition.

The chart on the opposite page, based on formulas appearing in the Heating, Ventilating, Air Conditioning Guide (which is published by the American Society of Heating and Ventilating Engineers) is unique in that it provides —in one chart—a means for solving for the actual velocity and velocity head of standard air in a rectangular duct, as well as for the sides of an equivalent duct, in addition to the usual unknowns. It may be used to solve problems in duct design as well as for checking an existing system. . . . The text, and the examples on the chart itself, explain its use fully. This chart was employed in designing ductwork for a unit of the new chronic disease hospital, Welfare Island, one of the postwar projects of the City of New York

MODEL OF POSTWAR HOUSING DEVELOPMENT

"Air view" of model of $50,000,000 "Stuyvesant Town" housing development of Metropolitan Life Insurance Co. planned for construction on lower East Side of Manhattan. It will include 8842 apartments and 24,315 occupants in 18 blocks holding 25 buildings each of them 13 stories tall





AIR DUCT FRICTION CHART

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AARON SHAPIRO, M.E.
DEPT. OF PUBLIC WORKS
CITY OF NEW YORK

Example: Given - CFM = 10,000; H_{S1} = 0.2 inches of water/100'; (or $H_{S1.1}$ = 0.22 inches of water/100')

Solution - See KEY Ⓐ Intersection of lines thru these two values locates a point whose velocity (in a round duct) = 2400'/min. Read diameter d_1 = 27.5" at line ⑤. Straight-edge thru d_1 = 27.5" on line ⑤ yields sets of values of a inches on line ① and b inches on line ② For example, a = 10", b = 75", the sides of a rectangular duct having the same value of H_{S1} (or $H_{S1.1}$) as the round duct.

To check an existing system, reverse the above procedure.

To obtain the velocity and velocity head for the rectangular duct - See KEY Ⓑ. Straight-edge thru a = 10" on line ③ and b = 75" on line ④ intersects line ⑤ in d_2 = 31", a round duct of the same area. Intersection of a line thru d_2 = 31" with a line thru 10,000 CFM locates a point whose velocity = 1930'/min. ⇒ H_v = 0.233 inches of water.

Simplifying Pipe Insulation Dimensions

Ray Thomas, Staff Engineer, Carbide and Carbon Chemicals Corp., Proposes a Rationalized System of Thermal Insulation Dimensions

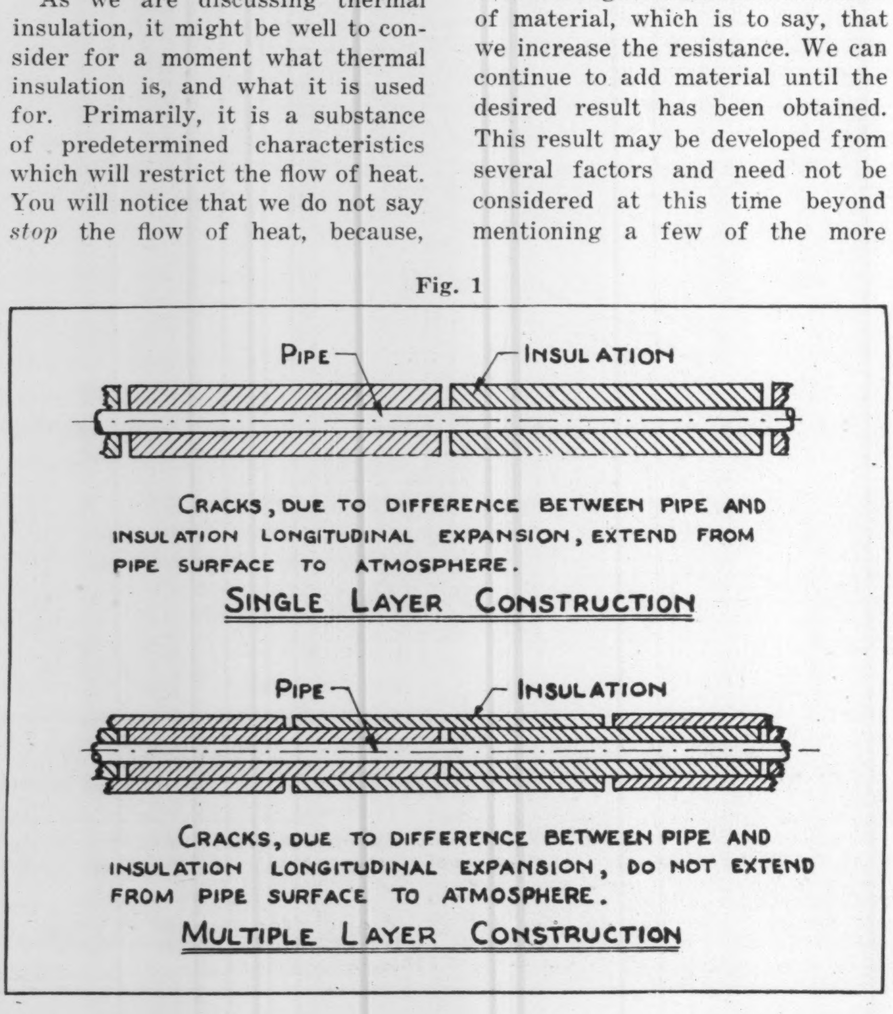
ANY PROGRAM, to be effective, must have cause and effect. This is no less true of the principle, which the author has evolved, for simplifying and rationalizing dimensions of thermal insulation. When we think of thermal insulation, it is reasonable to assume that those materials most frequently used by the individual become uppermost in the mind of that individual, and to the majority will most likely boil down to pipe covering, block and cement, and there it will end. Since it is the function of a pipe to carry gases and liquids, and since thermal insulation can not perform this function, it stands to reason that the latter must serve a purpose of its own, and should therefore be considered strictly in its own right as a pipe insulation, not merely as a covering. The preceding statements are neither made in jest, nor in a belittling attitude, but rather to point out the extent to which most of us rely on the local insulation contractor, or the manufacturer's representative, to furnish something just to cover the piping.

As we are discussing thermal insulation, it might be well to consider for a moment what thermal insulation is, and what it is used for. Primarily, it is a substance of predetermined characteristics which will restrict the flow of heat. You will notice that we do not say *stop* the flow of heat, because, while such a material might be highly desirable, it is nevertheless unobtainable. If we care to delve a little deeper, we find that such restrictions are the result of resistance set up to impede the flow of heat from a hot to a cold surface. Now then, if we want to reduce the flow of heat, it seems reasonable that we can accomplish this through additional thickness of material, which is to say, that we increase the resistance. We can continue to add material until the desired result has been obtained. This result may be developed from several factors and need not be considered at this time beyond mentioning a few of the more common ones, such as the prevention of sweating, freezing, condensation, heat loss, heat infiltration, and the provision of safety. In this case a moisture resistant material may be sufficient, but for other requirements, such as the increase or decrease of temperatures beyond certain limits, it becomes necessary to increase the thickness to provide greater resistance. Such thicknesses may range from a fraction of an inch up to several inches, and may be obtained by use of a single thickness of the individual layer or through the application of multiple layers.

Fractional thicknesses less than 1 in. are generally restricted to the moderate temperatures, and in many cases are increased beyond normal resistance requirements because of necessity for strength. A reduction in thickness may not be a matter of great concern for many small installations, but on many large industrial installations it is sometimes necessary, because of lack of space, to reduce the thickness of the insulation in order that the piping may be routed in a certain location. In the case of elevated temperatures, such a procedure only results in an increased loss of heat which in turn produces a hotter surface than desired. In the subzero applications, it cannot be treated so lightly because the dew point thickness becomes the limiting factor, and without a perfect seal, an even greater thickness than this minimum is demanded for satisfactory operation.

Among the more common materials produced for the moderate

Fig. 1


Pipe
Insulation
Cracks, due to difference between pipe and insulation longitudinal expansion, extend from pipe surface to atmosphere.
Single Layer Construction
Pipe
Insulation
Cracks, due to difference between pipe and insulation longitudinal expansion, do not extend from pipe surface to atmosphere.
Multiple Layer Construction

temperature range will be found the wool felts, laminated asbestos felts, mineral wool, hair felt, asbestos fibers, and some granular products. It is true that, where these materials are used for moderate temperature requirements, greater than one layer is rarely needed, but most of these materials can be used at much higher, and in some cases lower, temperatures. It is because of the latter statement that this dimensional scheme gets its application in the simplest form. For example, any available materials suitable for the service required, can be used providing they fit. Such materials as the above, however, in many cases do not nest with each other or even themselves, and are therefore unsuitable for application of more than one layer or for interchange with other materials.

Single Thickness vs. Multiple Layer

The insulation industry is in fair agreement regarding moderate temperature applications, but beyond, there exist two schools of thought and practice. One group holds to the belief in a single thickness, and opposed to this group, are the advocates of multiple layer materials for applications in excess of moderate thickness. Both may merit the acceptance of a belief in their respective methods, dependent on their experience, but an evaluation of the material in operation seems to favor multiple construction. Labor may, to some extent, modify the economic factor for such applications, but it is questionable whether a sufficient economic advantage is gained, through the reduced application cost of single layer construction, to justify use of the latter. Were it possible to obtain homogeneity in the application of all materials, such as is possible by the use of cements, providing uniform mix and density are maintained, then a single layer construction might have possibilities. Single layer construction relies, however, on the assumption that contractive and expansive characteristics are equal for both the pipe surface on which the insulation is being applied, and that of the insulant itself. Unfortunately this is not true for thermal insulation vs. metal pipe. In this connection, considerable discussion pertaining to the advantages of a loose, fibrous, material over that of a granular type material has been advanced for public consumption during the past few years. It is claimed by the fiber manufacturer that unbroken mass is obtained due to the intermingling of the loose fibers. This may be true providing the adjoining materials are placed tightly enough against each other, and can be maintained in that position throughout the life of the material. Granular materials, on the other hand, are somewhat variable, but in the main conform to a comparatively smooth surface, and are therefore governed more rigidly by close tolerances and clearances. Loose or fill type materials will not be considered here because we are now only concerned with formed products, especially pipe insulation.

The cement most commonly used to fill up the cracks and voids has a high shrinkage and low resistance value; therefore a much greater heat loss than is often realized, and which may become dangerous, is sustained at these points. The small losses sustained through these cracks may be justified by saying that a sufficient factor of safety is provided in the material thickness to allow for such slight losses. This may be true in the moderate temperature range, but it is not entirely true in the upper brackets, because competition too often demands minimum thicknesses in the basic materials—therefore a break at the weakest point increases that weakness.

A section of pipe insulation should always fit snugly enough to resist free turning on the pipe; otherwise it will result in an unsatisfactory fit. If too tight a fit is obtained on a hot line and longitudinal expansion is not equally distributed in the pipe, which has the greater travel, and its insulation, it stands to reason that a slight opening is going to occur at each joint, or if the sections are bonded to each other in such a manner that they all travel together, a much larger crack will appear at the end of the run. The foregoing examples are presented to show that cracks do occur under various conditions even where extreme precautions have been taken at the time of application. This being true, the need to improve present methods and materials, or to devise new methods to overcome these conditions, becomes apparent. One method would be to provide pipe insulation in multiple layers so that all joints could be broken, thereby avoiding through openings from pipe surface to the atmosphere, as shown in Fig. 1.

Standardizing Outside Diameter of Pipe Insulation

Let us neglect the heat transfer properties and consider for a moment the application of present materials in the insulation of a 1 in. standard steel pipe. For example, assume that sufficient standard thick 85 per cent magnesia insulation is available, but this thickness is insufficient to reduce the surface temperature to the desired level. A supply of air cell is also available for either a 2½ or a 3 in. pipe. This material applied over the 85 per cent magnesia would produce the desired surface temperature. If we use the 2½ in. size a wide gap will result because we attempt to place a 2.88 in. diameter material over a 3.13 in. diameter. On the other hand, if we use the large pipe insulation, we obtain an excessively loose fit because in this case a 3.50 in. diameter is being applied over a 3.13 in. diameter which is obviously not good practice. Similar examples can be found over the complete range of temperatures at which insulation materials are used. It can be readily seen how such a condition does not diminish a supply of good but odd dimensioned material, resulting in a sustained surplus stock.

This condition can be eliminated by providing a practicable schedule of sizes and thicknesses through a very simple process—*by making the outside diameters of all pipe insulation conform to the outside diameters of standard steel pipe as shown in Table* 1. Such a dimension would permit the application of any piece of pipe insulation over some other pipe insulation of suitable size as shown by a few extensions in Table 2. The only variation in such an arrangement would be confined to that of clearance and tolerance permitted by the various manufacturers in their products. The manufacturer in turn would be somewhat controlled by the consumer demand for improved dimensions or allowed to continue as usual through public indifference. The latter attitude is, however, not likely to exist because of a greater interest in, and desire for, knowledge of insulation products and their function on the part of the consumer.

Redesign by the pipe manufacturers to produce a common outside diameter for both piping and tubing would enable us to condense the rationalized system even more than now recommended.

Advantages of Rationalized System

Under the rationalized system, the consumer would be benefitted in stocking materials since such a method of sizing would enable him to use leftover material that otherwise might remain stored until the exact condition arrived for its specific application. In the case of special jobs requiring excessive thicknesses, such materials may remain for years, unless lack of storage facilities made it advisable to clean house, but if such materials were composed of thinner sections, they would likely be utilized within a short space of time. It is not unusual, around an industrial plant, to change the operation and temperature within a pipe. Such a change sometimes requires additional insulation without removal of that in place. A different but suitable type of material may be available for the job, but cannot be used because of a slight difference between the OD of one and the ID of the other. Such a condition could not exist with the proposed scheme in effect. The worst that might be encountered would be a loose fit because of too flexible clearances by the manufacturer in the ID of the larger section.

It is not intended to cover the more technical phases in this article, but for those who care to contemplate one outstanding advantage, some thought may well be devoted to equivalent thicknesses. With the present heterogeneous list of dimensions, it is possible to compare many different materials only after laborious computations, but with this scheme, D_e (equivalent thickness) values are at once ready for inspection and comparison. As an illustration, let us use a 1 in. standard steel pipe and see what happens when we endeavor to compare standard, nominal, and ice water thickness. Referring to a table of available materials, we find listed for a 1 in. pipe—standard, 0.88 in.; nominal, 1.00 in.; and ice water, 1.59 in., a difference of 0.71 in. between the minimum and maximum thicknesses or nearly ¾ in. If we try to reduce this difference by increasing our thickness to 1½ in., we find the following—double standard, 2.15 in.; nominal, 1.50 in.; and ice water, 1.59 in., a difference of 0.65 in. or approximately ⅝ in. Obviously these differences are too great for even rough calculations. Assuming we have materials in each classification suitable for the intended application, of similar conductivity [but a price differential makes it necessary to evaluate the three materials], six different computations would be required to determine the proper material to be used. With rationalized dimensions, however, not more than two, and possibly only one, computation would be required. It can be easily seen what a saving would be effected in this respect alone, since it is necessary to have tables for three different systems of sizes for existing materials, and *only one* would be required for the ration-

Table 1

PROPOSED BASIC SIZES OF INSULATION FOR PIPING

PIPE SIZE		NOMINAL 1" THICK		NOMINAL 1½" THICK		NOMINAL 2" THICK		NOMINAL 2½" THICK	
N.	OD.	THK	OD.	THK	OD.	THK	OD.	THK	OD.
¼	.540	1.142	2.875	1.453	3.500	1.953	4.500		
⅜	.675	1.076	2.875	1.641	4.000	2.141	5.000		
½	.840	1.000	2.875	1.562	4.000	2.062	5.000		
¾	1.050	.910	2.875	1.437	4.000	1.937	5.000		
1	1.315	1.092	3.500	1.562	4.500	2.093	5.562		
1¼	1.660	.930	3.500	1.625	5.000	1.906	5.562		
1½	1.900	1.031	4.000	1.531	5.000	1.844	5.562		
2	2.375	1.031	4.500	1.562	5.562	2.094	6.625		
2½	2.875	1.031	5.000	1.312	5.562	1.844	6.625		
3	3.500	1.000	5.562	1.531	6.625	2.031	7.625		
3½	4.000	1.281	6.625	1.281	6.625	1.776	7.625		
4	4.500	1.033	6.625	1.531	7.625	2.031	8.625		
4½	5.000	1.281	7.625	1.281	7.625	1.831	8.625		
5	5.563	1.000	7.625	1.500	8.625	2.000	9.625		
6	6.625	.970	8.625	1.437	9.625	2.000	10.750		
7	7.625			1.500	10.750	2.000	11.750	2.500	12.750
8	8.625			1.500	11.750	2.000	12.750	2.687	14.125
9	9.625			1.500	12.750	2.187	14.125	2.687	15.125
10	10.750			1.625	14.125	2.125	15.125	2.625	16.125
11				1.625	15.125	2.125	16.125	2.625	17.125
12	12.750			1.625	16.125	2.125	17.125	2.625	18.125
14	14.000			1.500	17.125	2.000	18.125	2.500	19.125
15	15.000			1.500	18.125	2.000	19.125	2.500	20.125
16	16.000			1.500	19.125	2.000	20.125	2.500	21.125
17	17.000			1.500	20.125	2.000	21.125	2.500	22.125
18	18.000			1.500	21.125	2.000	22.125	2.500	23.125
19	19.000			1.500	22.125	2.000	23.125	2.500	24.125
20	20.000			1.500	23.125	2.000	24.125	2.500	25.125
21	21.000			1.500	24.125	2.000	25.125	2.500	26.125
22	22.000			1.500	25.125	2.000	26.125	2.500	27.125
23	23.000			1.500	26.125	2.000	27.125	2.500	28.125
24	24.000			1.500	27.125	2.000	28.125	2.500	29.125
25	25.000			1.500	28.125	2.000	29.125	2.500	30.125
26	26.000			1.500	29.125	2.000	30.125	2.500	31.125
27	27.000			1.500	30.125	2.000	31.125	2.500	32.125
28	28.000			1.500	31.125	2.000	32.125	2.500	33.125
29	29.000			1.500	32.125	2.000	33.125	2.500	34.125
30	30.000			1.500	33.125	2.000	34.125	2.500	35.125

alized system. While we are not disposed to attempt to enumerate all the advantages or possible disadvantages, to either the manufacturer or consumer, there are obvious potential benefits to be derived by the manufacturer. To name a few, he should be able to effect a reduction in the number of items manufactured, due to the interchange of fabricated materials. For instance, basic Table 1 does not list any thicknesses greater than 2½ in. If the manufacturer elects to adopt this table as his regular stock, and receives an order for 3 in. thick material, he may draw a 1 in. and a 2 in. section, or two 1½ in. sections of the proper sizes, and nest them together either loose, or if preferred, cemented together to form the 3 in. thick material. Any greater thicknesses may likewise be fabricated to form special orders. Such a schedule should eliminate special scheduling through a factory, machine setups, handling, and storage. It should likewise reduce shipping space requirements through nesting of the materials where possible.

For those materials which incorporate sufficient strength to support the combined weight of the pipe and insulation, it is usually desirable to place the supporting hangers on the outside of the insulation. This is true for two reasons. It provides continuity of application and unbroken weatherproofing, which is always highly desirable. A still greater asset, from the maintenance point of view, is that the hangers may be worked on without disturbing the insulation. Based on the present method of dimensioning pipe insulation, a large number of hanger sizes are required to supply the demand. Here again, the rationalized system simplifies this, in that approximately only one-third of the number now required would be needed. Nothing has been said about tubing, but *no* additional hangers would be required for tubing, because the OD of all tubing insulation would correspond to the OD of a standard steel pipe, and additional layers for tubing would be supplied from the piping stock. The mechanical piping draftsman will appreciate this outstanding reduction in the number of sizes. This simplification becomes even more apparent as it applies to the man on the job who may not have access to a table, but who through association has memorized pipe diameters. This refers especially to the pipefitter, millwright, or just plain handyman. These mechanics will appreciate the value of these simplified sizes in making up and setting their pipe hangers.

The rationalized scheme is probably of greater benefit to small companies from a personnel standpoint than it is to their larger brothers, because they would not have to refer to any table, with the exception of one showing outside pipe diameters.

The field of thermal insulation and refractories is becoming more complex with each advancing year, because of the new materials being almost constantly introduced and the improvements of those already existent. In a large corporation the demand for the services of the heat transfer engineer, who specializes in thermal insulation and refractory products and problems, is constantly increasing. This consultant must not only be expert in the field of application but must be no less proficient in the specification, design, and research of these materials.

Many outstanding movements are afoot to bring about a general adoption of the metric system, modular system, etc. We also have many organizations whose efforts are directed toward the promotion and adoption of uniform standards for industry. It seems quite logical, therefore, that the insulation industry should take its place among other leaders in the promotion of an up-to-date method of rationalizing dimensions.

Table 2

MULTIPLE LAYERS OF PROPOSED BASIC SIZES.*

PIPE SIZE		2" THICK						2½" THICK						3" THICK						3½" THICK								
		INNER LAYER		SECOND LAYER			TOTAL	INNER LAYER		SECOND LAYER			TOTAL	INNER LAYER		SECOND LAYER			TOTAL	INNER LAYER		SECOND LAYER			THIRD LAYER			TOTAL
I.P.S.	OD.	THK	OD.	IPS	THK	OD.	THK	THK	OD	IPS	THK	OD.	THK	THK	OD.	IPS	THK	OD.	THK	THK	OD	IPS	THK	OD	IPS	THK	OD.	THK
¼	.54	1.14	2.88	2½	1.03	5.00	2.17	1.14	2.88	2½	1.31	5.56	2.45	1.45	3.50	3	1.53	6.63	2.98	1.14	2.88	2½	1.03	5.00	4½	1.28	7.63	3.45
⅜	.68	1.08	2.88	2½	1.03	5.00	2.11	1.08	2.88	2½	1.31	5.56	2.39	1.64	4.00	3½	1.28	6.63	2.92	1.08	2.88	2½	1.03	5.00	4½	1.28	7.63	3.39
½	.84	1.00	2.88	2½	1.03	5.00	2.03	1.00	2.88	2½	1.31	5.56	2.31	1.56	4.00	3½	1.28	6.63	2.84	1.00	2.88	2½	1.03	5.00	4½	1.28	7.63	3.31
¾	1.05	.91	2.88	2½	1.03	5.00	1.94	.91	2.88	2½	1.31	5.56	2.22	1.44	4.00	3½	1.28	6.63	2.72	.91	2.88	2½	1.03	5.00	4½	1.28	7.63	3.22
1	1.32	1.06	3.50	3	1.00	5.56	2.06	1.06	3.50	3	1.53	6.63	2.59	1.56	4.50	4	1.53	7.63	3.09	1.06	3.50	3	1.00	5.56	5	1.50	8.63	3.56
1¼	1.66	.93	3.50	3	1.00	5.63	1.93	.93	3.50	3	1.53	6.63	2.46	1.63	5.00	4½	1.28	7.63	2.91	.93	3.50	3	1.00	5.56	5	1.50	8.63	3.43
1½	1.90	1.03	4.00	3½	1.28	6.63	2.31	1.03	4.00	3½	1.28	6.63	2.31	1.53	5.00	4½	1.28	7.63	2.81	1.03	4.00	3½	1.28	6.63	6	1.44	9.63	3.75
2	2.38	1.03	4.50	4	1.03	6.63	2.06	1.03	4.50	4	1.53	7.63	2.56	1.56	5.56	5	1.50	8.63	3.06	1.03	4.50	4	1.03	6.63	6	1.44	9.63	3.50
2½	2.88	1.03	5.00	4½	1.28	7.63	2.31	1.03	5.00	4½	1.28	7.63	2.31	1.31	5.56	5	1.50	8.63	2.81	1.03	5.00	4½	1.28	7.63	7	1.50	10.75	3.81
3	3.50	1.00	5.56	5	1.00	7.63	2.00	1.00	5.56	5	1.50	8.63	2.50	1.53	6.63	6	1.44	9.63	2.97	1.00	5.56	5	1.00	7.63	7	1.50	10.75	3.50
3½	4.00	1.28	6.63	6	.97	8.63	2.25	1.28	6.63	6	1.44	9.63	2.72	1.28	6.63	6	1.44	9.63	2.72	1.28	6.63	6	.97	8.63	8	1.50	11.75	3.75
4	4.50	1.03	6.63	6	.97	8.63	2.00	1.03	6.63	6	1.44	9.63	2.47	1.53	7.63	7	1.50	10.75	3.03	1.03	6.63	6	.97	8.63	8	1.50	11.75	3.50
4½	5.00	1.83	8.63				1.83	1.28	7.63	7	1.50	10.75	2.78	1.28	7.63	7	1.50	10.75	2.78	1.28	7.63	7	2.00	11.75				3.28
5	5.56	2.00	9.63				2.00	1.00	7.63	7	1.50	10.75	2.50	1.50	8.63	8	1.50	11.75	3.00	1.50	8.63	8	2.00	12.75				3.50
6	6.63	2.00	10.75				2.00	.97	8.63	8	1.50	11.75	2.47	1.44	9.63	9	1.50	12.75	2.94	1.44	9.63	9	2.19	14.13				3.62
7	7.63	2.00	11.75				2.00	2.50	12.75				2.50	1.50	10.75	10	1.63	14.13	3.13	1.50	10.75	10	2.13	15.13				3.63
8	8.63	2.00	12.75				2.00	2.69	14.13				2.69	1.50	11.75	11	1.63	15.13	3.13	1.50	11.75	11	2.13	16.13				3.63
9	9.63	2.19	14.13				2.19	2.69	15.13				2.69	1.50	12.75	12	1.63	16.13	3.13	1.50	12.75	12	2.13	17.13				3.63
10	10.75	2.13	15.13				2.13	2.63	16.13				2.63	1.63	14.13	14	1.50	17.13	3.13	1.63	14.13	14	2.00	18.13				3.63
11		2.13	16.13				2.13							1.63	15.13	15	1.50	18.13	3.13	1.63	15.13	15	2.00	19.13				3.63
12	12.75													1.63	16.13	16	1.50	19.13	3.13	1.63	16.13	16	2.00	20.13				3.63
14	14.00													1.50	17.13	17	1.50	20.13	3.00	1.50	17.13	17	2.00	21.13				3.50
15	15.00													1.50	18.13	18	1.50	21.13	3.00	1.50	18.13	18	2.00	22.13				3.50
16	16.00													1.50	19.13	19	1.50	22.13	3.00	1.50	19.13	19	2.00	23.13				3.50
17	17.00													1.50	20.13	20	1.50	23.13	3.00	1.50	20.13	20	2.00	24.13				3.50
18	18.00													1.50	21.13	21	1.50	24.13	3.00	1.50	21.13	21	2.00	25.13				3.50
19	19.00													1.50	22.13	22	1.50	25.13	3.00	1.50	22.13	22	2.00	26.13				3.50
20	20.00													1.50	23.13	23	1.50	26.13	3.00	1.50	23.13	23	2.00	27.13				3.50
21	21.00				NOTE*									1.50	24.13	24	1.50	27.13	3.00	1.50	24.13	24	2.00	28.13				3.50
22	22.00													1.50	25.13	25	1.50	28.13	3.00	1.50	25.13	25	2.00	29.13				3.50
23	23.00													1.50	26.13	26	1.50	29.13	3.00	1.50	26.13	26	2.00	30.13				3.50
24	24.00													1.50	27.13	27	1.50	30.13	3.00	1.50	27.13	27	2.00	31.13				3.50
25	25.00													1.50	28.13	28	1.50	31.13	3.00	1.50	28.13	28	2.00	32.13				3.50
26	26.00													1.50	29.13	29	1.50	32.13	3.00	1.50	29.13	29	2.00	33.13				3.50
27	27.00													1.50	30.13	30	1.50	33.13	3.00	1.50	30.13	30	2.00	34.13				3.50
28	28.00													1.50	31.13	31	1.50	34.13	3.00	1.50	31.13	31	2.00	35.13				3.50
29	29.00													1.50	32.13	32	1.50	35.13	3.00	1.50	32.13	32	2.00	36.13				3.50
30	30.00													1.50	33.13	33	1.50	36.13	3.00	1.50	33.13	33	2.00	37.13				3.50
31	31.00													1.50	34.13	34	1.50	37.13	3.00	1.50	34.13	34	2.00	38.13				3.50

NOTE: * FURNISHED IN SEGMENTAL FORM.
ALL DIMENSIONS ARE EXPRESSED IN TERMS OF INCHES.

Practical Pointers

OBSERVE SAFETY RULES WHEN CLEANING SOLVENT TANKS

The cleaning or repair of tanks in which organic solvents are used should not be undertaken without rigid precautions, inasmuch as the vapors of all organic solvents are toxic and the majority are flammable as well, says the Safety Research Institute. Oxygen deficiency in the tank is another hazard which must be considered.

If a tank has contained a flammable solvent, the safest method for removing the vapors, preparatory to cleaning or repair, appears to be thorough flushing by steam, followed by mechanical ventilation of a type approved for flammable vapors, according to the SRI. Steam jets to loosen sludge have been successful, the tank then being washed, drained, and dried out with warm air. If the use of steam is impractical, the sludge may be washed out with high pressure hose, but care must be exercised to avoid building up static electricity. Steam also has some disadvantages, such as the building up of combustible mixtures at the vents. Nonsparking shoes and tools, vaporproof lamps, and protective clothing should be utilized, and otherwise the code for flammable liquids and gases of the National Fire Protection Association should be observed.

Before cleaning a tank that has contained a nonflammable solvent, the concentration of vapor in the tank should be reduced as much as possible, preferably by mechanical ventilation.

The cleaning of any tank that has contained an organic solvent should be done from outside the tank, if possible. In degreasing processes utilizing nonflammable solvents, where the process is wholly or substantially enclosed, metal chips, mud, and other solid residues are usually removed by scraping, and a cleanout door is generally provided through which the sludge may be removed by a long handled scraper. The liquid residue and sludge are immediately confined, to lessen volatilization of the solvent in the atmosphere. An approved canister type gas mask is advisable.

If cleaning from the outside is not possible, before entry into the tank, an air test by a competent chemist is advised by the SRI. Workmen who must enter should be further protected, preferably by air line respirators approved by the U. S. Bureau of Mines for the purpose, though, in some cases, canister type gas masks approved for organic vapors may be used. Protective clothing should be afforded and there should be stationed outside the tank a watcher holding a rope or harness attached to the person inside, in order to haul him out at the first sign of trouble.

Whether the tank is cleaned from the inside or outside, however, workmen in the surrounding area also should be protected from the possibility of vapor inhalation or the outbreak of fire. Organic vapors are heavier than air and tend to settle in low places, so that the atmosphere may be practically free of vapors at breathing level and yet contain a mixture that is explosive or hazardous to health at or near the floor or in a nearby pit.

Any recommendations provided by the chemical or equipment manufacturers should be carefully observed, and all workmen should be thoroughly drilled in safe practice.

ENGINEER TROOPS BUILD THE "BAMBOO INCH"

In China at the U. S. Army's "end of the line" of supply—by far the longest military supply line of history—soldier ingenuity and handicraft pay off. Supplies over the 19,000 mile water, rail, and air route are not delivered just because they are "needed"—they come only if they are indispensable, and then sometimes they cannot be lifted over the "Hump" right away.

Down a mountain slope in southwest China, back of the ground fighting on the world's highest and toughest battle ground, the 12,000 ft Kaoli Kung mountains west of the Salween river in Yunnan province, China, there is a 600 ft water line which illustrates the ingenuity that is required.

The water line was needed between a spring and an Army mess of "Y-Force Operations Staff." At a military post in the United States that 600 ft would be spanned by ¾ in. water pipe. In China, water pipe was needed. So was the shipping space it would require.

The problem was solved by a corps of engineers detachment. Native wood could suffice for the water line. Material for the conduit was found growing in a wild bamboo thicket.

In a matter of hours, 600 ft of large bamboo stems were cut, the joint piths were rammed out with a rod, connections were calked, small holes were filled with wooden pegs, and the line was complete.

GI Joe names most things, and this little 600 ft job was called the "Bamboo Inch."

U. S. soldiers in southwest China use a rod to knock through the pit-filled sections in a length of bamboo for use as a water line

Heating, Piping & Air Conditioning

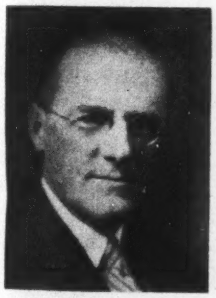
AMERICAN SOCIETY *of* HEATING *and* VENTILATING ENGINEERS

Journal *Section*

51st Annual Meeting Program

January 22-24 Boston Hotel Statler

Earl G. Carrier
General Chairman



W. T. Jones
Advisory Chairman

PLANS for the program of the 51st annual meeting to be held at Hotel Statler, Boston, Mass., January 22-24, 1945, have been made by the Committee on Arrangements of Massachusetts Chapter to provide an interesting and instructive meeting for members who attend. Representatives of the Society's 37 chapters will be present for a meeting on Monday morning, January 22.

The Program Committee has announced four technical sessions, the first at 1:30 p.m. on the 22nd, and morning and afternoon sessions on the 23rd, and a morning session only on the 24th.

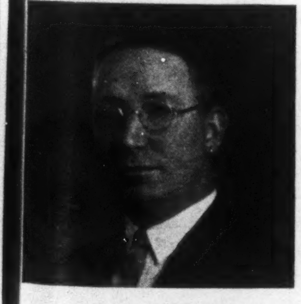
A variety of subjects has been selected for the technical sessions, and among the papers to be presented are: Studies of the Mechanism of Solution of CO_2 in Condensates Formed in the Steam Heating Systems of Buildings; A Survey of Testing Methods and Rating Limits for Domestic Heating Devices; Radiation Corrections for Basic Constants used in the Design of All Types of Heating Systems; Control of Industrial Atmospheres (Dusts, Fumes, Mists, Vapors and Gases); Altitude Chamber for Study of Heating and Air Conditioning Problems; Mine Ventilation and Its Relation to Health and Safety; Summer Weather Data and Sol-Air Temperature—Study of Data for New York City.

A great many committees have indicated a desire to hold meetings and these are being scheduled for Sunday,

P. A. Croney
Registration

A. C. Bartlett
Publicity

A. L. Hesselschwerdt, Jr.
Ladies

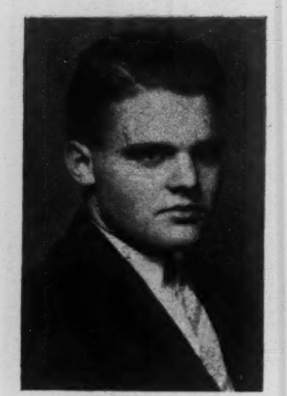


James Holt

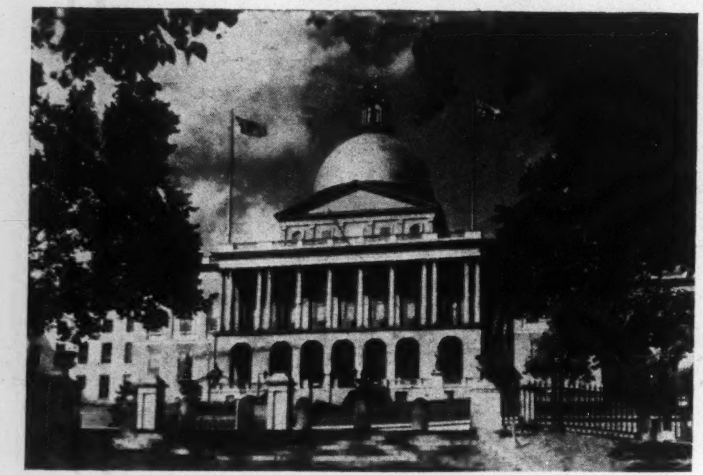
David Archer
Vice-Chairmen

F. R. Ellis
Transportation

G. B. Gerrish
Banquet



C. M. F. Peterson
Entertainment



State Capitol Building

J. W. Brinton
Finance

January 21, for Monday, January 22, and at other times at which there will be least conflict with other functions.

The Council will hold two meetings, the first at 1:30 p.m., January 21, and the organization meeting of the new Council at 1:30 p.m., January 24.

The General Chairman of Arrangements, Earl G. Carrier, has announced that the social functions will be a get-together supper on Monday evening, and the annual dinner on Tuesday night. For the ladies a special program has been arranged with radio broadcasts on Sunday afternoon, a shopping tour on Monday morning, a bridge-tea on Monday afternoon, trips to historical places on Tuesday morning, and a visit to the Fogg and Agassiz Museums where glass flowers and paintings are on display on Tuesday afternoon.

It is the desire of the local committee to arrange whatever inspection trips are desired by visiting members. If a group expresses a wish to see some of the other points of interest in Boston, arrangements will be made and guides will be provided.

The Committee on Arrangements is taking every precaution for the comfort of the members who attend the 51st Annual Meeting, and because of the present conditions faced by the transportation lines and hotels, the Committee makes the following suggestions:

1. Make hotel reservations 30 days in advance, but not later than January 10; otherwise, the headquarters' hotel may not be able to provide the kind of rooms that are requested.
2. When making hotel reservations indicate the approximate hour of a rival and if original date is chang it is important to advise the ho promptly.
3. All uncalled for reservations a automatically canceled at 6:00 p.m. that reservations can be held for lat arrival only when hotel is advised.
4. When making reservations me bers should indicate their identity wi the ASHVE.
5. In making hotel room reservatio on the special cards provided, me bers should indicate first and seco choice of accommodations.
6. Railroad reservations to Bost should be made preferably, two three weeks in advance of the me ing and Pullman accommodations f both going and return trips should obtained.
7. Whenever possible, travel on o hour trains as the popular trains a always crowded.
8. Travel with minimum amount personal baggage.

Boston is adequately served the railroads and airlines a through cars are available to Bo ton from the following cities: Bu falo, Chicago, Cincinnati, Cleve land, Detroit, Montreal, New Yor Pittsburgh, St. Louis, Syracus Toronto and Washington, D. C.

SCHEDULE OF EVENTS
51st Annual Meeting

January 21

10:00 a.m.	Committee Meetings
1:30 p.m.	Council Meeting
4:30 p.m.	Committee on Research

January 22

9:00 a.m.	Registration
9:30 a.m.	Committee Meetings
9:30 a.m.	Chapter Delegates Conference
1:30 p.m.	Business Session
7:00 p.m.	Get-together Supper
7:00 p.m.	Organization Meeting 1945 Committee on Research

January 23

9:30 a.m.	Technical Session
1:30 p.m.	Technical Session
7:00 p.m.	Annual Banquet

January 24

9:30 a.m.	Technical Session
12:30 p.m.	Nominating Committee Meeting
1:30 p.m.	Organization Meeting of Council

Committee on Arrangements

Earl G. Carrier, ***General Chairman***

Vice-Chairmen

James Holt and David Archer

W. T. Jones, ***Advisory Chairman***

Banquet	**G. B. Gerrish**
Finance	**J. W. Brinton**
Transportation	**F. R. Ellis**
Publicity	**A. C. Bartlett**
Entertainment	**C. M. F. Peterson**
Ladies	**A. L. Hesselschwerdt, Jr.**
Reception and Registration	**P. A. Croney**

1944 • Greetings • 194

As the 50th Anniversary year of the Society comes to a close there is ample evidence that the ASHVE has enjoyed a great past, and a greater future is in prospect. The Officers and the Members of Council extend to all members of the Society hearty greetings for this Holiday Season and sincere good wishes for a Very Merry Christmas and a Happier New Year in 1945.

Radiation Corrections for Basic Constants Used in the Design of All Types of Heating Systems

By B. F. Raber[*] and F. W. Hutchinson,[**] Berkeley, Calif.

Third progress report of research sponsored by the American Society of Heating and Ventilating Engineers in cooperation with the University of California.

SUMMARY—This paper has been prepared as a progress report, not on laboratory work on the panel project, but as a gathering of notes relative to the fundamentals of load determination for heating systems as influenced by radiant exchange. Part I of this report proposes a rational procedure for determining the design inside air temperature for an enclosure heated by any conventional system of the convective type. Parts II and III are devoted to an examination of the inside and outside combined surface heat transfer coefficients for convection and for radiation.

ALTHOUGH UNDERTAKEN primarily for the purpose of investigating radiant energy exchange as a factor in the design and analysis of panel heating and panel cooling systems, the cooperative panel heating research project has also provided an opportunity for systematizing, and in some cases rationalizing, the procedures used in heat load computations for all types of heating systems. Thus, while the more technical aspects of panel heating procedures, as developed in the various progress reports prepared on this cooperative project, are of limited interest to the designer who is not working with panel systems, there are, nonetheless, certain broad fundamentals of radiant exchange to which attention can be occasionally directed and which are of the utmost importance to every designer whether he be working with panel, radiator, convector, or warm air heating systems. While results of such general interest are necessarily of secondary importance to the main objective of the project, they are, however, indicative of a frequently overlooked service which specialized research is sometimes able to afford to general advancement in a wide field. Thus, sponsorship of an investigation on a subject of restricted or of only potential interest may be justified, not merely through the probability of establishing new procedures which may be needed in the future, but also through the possibility of simplifying and of generalizing existing procedures in a way which will present greater effectiveness in their use *now*.

In all heating systems, of whatever type, three fundamental problems require consideration, as follows:

1. The energy exchange between occupant and his environment with emphasis on the convection-radiation relationship which is required to exist if comfort is to be realized.
2. The energy exchange inside the enclosure by convection between room air and solid surfaces and by radiation among the various types of surfaces which make up the enclosure.
3. The energy exchange between the exterior of the enclosure and its surroundings, the latter consisting of the ambient air, objects *seen* by the exterior surfaces (as the earth, other houses, the sun, etc.) and the sky.

Each of the foregoing problems is given a highly conventional and, in some cases, inexact treatment in the standard load determination procedure which is used in designing usual types of heating systems. With panel heating, however, the added emphasis on radiant exchange requires that more careful consideration be given to each of these problems and that more precise methods be established for evaluating design coefficients. Once these new methods have been developed, they afford an obvious opportunity for investigating the accuracy and the adequacy of the conventional procedures and they also, in some cases, afford a means of revising or of limiting the accepted values of design coefficients. The intent of this report is to call attention to two specific instances in which consideration of radiant exchange will significantly alter accepted ideas of design coefficients and, further, to provide in convenient graphical form a simplified and generalized means of selecting a design value of the inside air temperature corrected for radiant interchange between the occupant and the enclosing surfaces. Each of the three items considered in this report appears under one or another of the three major problems which have been listed in the preceding paragraph. For convenience, therefore, and to identify each constant with the over-all design problem of which it is a part, the report has been prepared in three sections.

PART I. The Design Inside Air Temperature

The development in this section is based on the assumption that the designer is desirous of establishing environmental conditions equivalent to those which would exist in a room with air at 70 F and all inside surfaces at the same temperature. If, for any reason, the system is designed to provide a basic temperature other than 70 F the results of this analysis can still be used, with accuracy ade-

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[*] Professor of Mechanical Engineering, and Chairman, Division of Mechanical Engineering, University of California.

[**] Associate Professor of Mechanical Engineering, University of California.

For presentation at the 51st Annual Meeting of the American Society of Heating and Ventilating Engineers, Boston, Mass., January 1945.

quate for all practical purposes, by altering the corrected design inside air temperature by an amount equal to the difference between the base design temperature and 70 F. Except in the case of rooms having no transmitting surfaces, the average surface temperature of the enclosure will differ from that of the room air. In a room heated by radiant means the air temperature will usually be less than the average surface temperature, while in rooms heated by cast-iron radiators, convectors, or warm air systems the air temperature will inevitably exceed the average temperature of the enclosing surface. When the outside temperature is low or when the enclosure has walls of high conductance, the inside surface temperature may be reduced to a point such that some radiant loss will occur from the occupant. Under such conditions an appreciable increase in the design inside air temperature will be necessary in order to reduce the convective heat loss of the occupant by an amount sufficient to provide compensation and thereby re-establish an equilibrium heat balance in the region of comfort.

The magnitude of the compensating inside air temperature increase has been investigated experimentally by Houghten and McDermott[1] and their results—based on 51 tests—are summarized in a graph.[2] From this figure the required design inside air temperature in a room having three exposed walls with 45 F inside surface temperature is 79 F, an increase of 9 F needed to compensate for the greater rate of radiant loss from occupant to cold walls. The Guide data provide an excellent reference for roughly estimating the relationship between cold walls and the feeling of warmth, but they cannot effectively be extrapolated from the single experimental condition of three cold walls and do not provide a means of integrating the effect of various types of surface (with correspondingly different inside surface temperatures) which are likely to be found in an actual design problem. Further, the Guide data are expressed in terms of inside surface temperature and hence, for use in practice, require an analysis by the designer involving computations based on the actual conductances and the design value of the outside air temperature.

The same problem can be solved in a general form and expressed in terms of variables more amenable to exact and rapid use by the designer if the comfort equation which is used in design of radiant heating systems is accepted as a criterion of effectiveness and used in establishing a rational basis for the solution of the cold wall problem in convective heating. Neglecting the differences which can be shown to exist between the mean radiant temperature and the weighted average inside temperature, t_s, an approximate comfort equation can be written in the form,

$$t_a = \varnothing(t_s) \quad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

where $t_s = (\Sigma t_x A_x)/(\Sigma A_x)$; t_x is the temperature of any section of inside surface of area A_x over which the surface temperature does not vary appreciably; t_a is the design value of the inside air temperature corresponding to which a heat balance on the occupant in the room will be the same as though air and walls were uniformly at 70 F. In order to attain a solution having the desired simplicity, it is necessary first to evaluate t_s in terms of t_a and in terms of the physical constants of the room, then to fix explicitly the functional relationship indicated above by the symbol $\varnothing$, and finally to prepare a graphical solution of Equation (1) from which t_a can be readily determined from known or readily calculable constants of the system.

The problem of expressing t_s in terms of t_a and of physical constants is a simple one and can be solved from the fundamental heat transfer equations. For steady state conditions the rate of heat flow to an inside surface must equal the rate of heat transfer through that surface so the equation can be written,

$$U_x A_x (t_a - t_o) = h_x A_x (t_a - t_x) \quad \ldots\ldots\ldots\ldots\ldots\ldots (2)$$

where t_a and t_o are inside and outside design air temperatures, U_x is the over-all coefficient of heat transfer for the section of area A_x, and h_x is the combined inside film coefficient for transfer by convection and radiation. Strictly speaking, h_x would not have the same value for all points inside the enclosure, but accepted practice[3] is to consider this coefficient as having the constant value of 1.65 Btu/(hr) (sq ft) (deg F). When this assumption is permissible, Equation 2 reduces to the form,

$$t_x = t_a - 0.606\, U_x\, (t_a - t_o) \quad (3)$$

Then substituting from Equation 3 for t_x in the definition of t_s,

$$t_s = \frac{\Sigma\, [t_a - 0.606\, U_x\, (t_a - t_o)]\, A_x}{\Sigma A_x}$$

$$= t_a - 0.606\, (t_a - t_o) \left(\frac{\Sigma U_x A_x}{\Sigma A_x} \right). \quad (4)$$

The last parenthesis of Equation 4 is an integrating term leading to a weighted average value of the over-all coefficient of heat transfer and can be used to define an equivalent over-all coefficient,

$$U_s = \frac{\Sigma U_x A_x}{\Sigma A_x} \quad \ldots\ldots\ldots\ldots (5)$$

where U_s is the equivalent uniform over-all coefficient of heat transfer of a room which would have exactly the same heat load (and the same t_s) as the actual room. This equivalent-room concept is a valuable tool for exploiting in full the possibilities of simplifying existing procedures for heat load determination and for performance analysis of either convection or radiant heating systems. The most general expanded form of Equation 5 which is likely to be needed for any average room is,

$$U_s = \frac{A_g}{A_s} U_g + \frac{A_w}{A_s} U_w + \frac{A_f}{A_s} U_f$$

$$+ \frac{A_c}{A_s} U_c + \frac{A_i}{A_s} U_i \quad \ldots\ldots (6)$$

where the subscripts *g*, *w*, *f*, *c*, and *i* refer to glass, exterior wall, floor, ceiling, and interior wall, respectively. The denominator, A_s is the total inside surface area of the enclosure. In most cases the interior partitions are non-transmitting, so U_i becomes zero; where this occurs it is important to note that the A_s term must continue to include the partition area even though there is no longer an explicit $\Sigma A_i U_i$ term in Equation 6.

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[1] ASHVE Research Report, No. 946—Cold Walls and Their Relation to Feeling of Warmth, by F. C. Houghten and Paul McDermott, (ASHVE Transactions, Vol. 39, 1933, p. 83.)

[2] Heating, Ventilating, Air Conditioning Guide 1944, p. 63.

[3] Heating, Ventilating, Air Conditioning Guide 1944, p. 91.

Noting that the transmission heat load from the actual room is customarily calculated from the equation,

$$Q_t = \Sigma U_x A_x \ (t_a - t_o) = (t_a - t_o) \Sigma U_x A_x = (t_a - t_o) \ U_s A_s \quad \ldots\ldots\ldots\ldots (7)$$

it is apparent that the designer can readily determine U_s from computations which must, in any event, be carried out in determining the heat load; thus, while U_s is a new term, it is not one which requires calculation in excess of that otherwise necessary. Then, substitution from Equations 4 and 5 back into the comfort Equation 1 gives,

$$t_s = \phi \, [t_a - 0.606 \, (t_a - t_o) \, U_s] \quad \ldots\ldots\ldots\ldots (8)$$

The next requirement is to fix explicitly the functional relationship between the air temperature and the average surface temperature. If, as noted before, the differences between mean radiant temperature and average surface temperature can be neglected for practical convective heating purposes (consideration of such differences is hardly justified in view of the inaccuracy inherent in use of a fixed value of h_x) then the problem reduces to one of evaluating the increase in air temperature needed to compensate for a 1 F change in the mean radiant temperature. Experimental evidence on this subject is not yet conclusive, nor is opinion undivided. Dr. C.-E. A. Winslow's work at the Pierce Laboratories and Dr. Thomas Bedford's experimental work in England both indicate that, in the comfort region, a 1 F change in mean radiant temperature can be compensated by an opposite and equal change in air temperature. This relationship was likewise observed by the authors in the reflection room tests[4] which have been previously reported. From theoretical considerations it can be shown also[5] that the influence of mean radiant temperature would be expected to be not less than equal to that of air temperature.

The only experimental work done explicitly to evaluate cold wall effects was that of Houghten and McDermott,[6] which has been previously referred to. Their results have not been expressed in terms of a t_a vs. t_s relationship, but from the data and from the published description of conditions under which the tests were made it is possible to calculate the ratio of air temperature increase to average surface temperature decrease. Examples of such calculations are given.

Example: The 5 ft x 6 ft x 6 ft *cold wall* room used in the ASHVE tests[7] had two 6 ft x 6 ft cold walls and one 5 ft x 6 ft. The total cold wall area was therefore 102 sq ft. Floor and ceiling were of lattice work and ventilation air passed in through the ceiling lattice and out through the floor lattice; the ventilation rate was 31,800 cfh so the surface temperatures of the floor and ceiling (though not given in the original report) can probably be taken as close to air temperature. Likewise, the temperature of the one 30 sq ft uncooled wall is not specified so will be taken as approximately room air temperature. Then for conditions in the test room,

$$t_s = \frac{90}{192} t_a + \frac{102}{192} t_c$$
$$= 0.469 \, t_a + 0.531 \, t_c$$

where t_a and t_c are the room air and cold wall temperatures.

Referring to the test data (ASHVE GUIDE, 1944, Fig. 10, p. 63) for conditions equivalent to a room with air and walls at 70 F:

t_c	t_a	$t_s = 0.469 \, t_a + 0.531 \, t_c$	$(t_a - 70) / (70 - t_s) = \dfrac{\Delta t_a}{\Delta t_s}$
45	79	60.95	0.994
50	75.8	62.1	0.734
55	73.9	63.85	0.634
60	72.4	65.80	0.561
65	71.2	67.90	0.571
70.0	70.0	70.0	....

The gradual increase in the $\Delta t_a / \Delta t_s$ ratio as t_s decreases is interesting. From the standpoint of accuracy in physical measurement the data for low wall temperatures would be expected to be more accurate than for higher wall temperatures since the magnitude of the two differences which are used in calculating the ratio are much greater for these conditions. On the other hand the increased magnitude of the ratio may be due to changing influences of the assumption that the surface of the floor, ceiling, and uncooled wall were at room temperature.

In a more recent paper, Houghten[8] and co-workers find an even lower ratio, 0.3 deg ET (approximately 0.4 deg dry-bulb temperature) as a compensating air change for a 1 F change in MRT. Based largely on this latter report The Guide (1944, p. 64) gives 0.5 deg ET (approximately 0.62 deg dry-bulb temperature) as the air temperature alteration needed for each 1 F change in MRT (mean radiant temperature).

Faced with the differences of data and of opinion as evidenced above, an arbitrarily selected value of the $\Delta t_a / \Delta t_s$ ratio will be selected for the present purpose. Based on a study of all available data and with due allowance for the need of selecting a ratio which, if in error, will give a margin of safety, the authors suggest that the 1 to 1 ratio, in agreement with the findings of Dr. Winslow and co-workers and of Dr. Bedford and co-workers, be used. Such a value seems a feasible one, not only because there is a substantial body of data in support of it, but also because its use will give over-correction rather than under-correction of the air temperature. Using the 1 to 1 ratio and taking 70 F air with 70 F walls as a base condition, the comfort Equation 1 takes the very simple form,

$$t_a = 140 - t_s \quad \ldots\ldots\ldots\ldots (9)$$

and Equation 8 becomes,

$$t_a = 140 - t_a + 0.606 \, (t_a - t_o) \, U_s \quad \ldots\ldots (10)$$

or,

$$t_a = \frac{140 - 0.606 \, U_s t_o}{2 - 0.606 \, U_s} \quad \ldots\ldots (11)$$

Equation 11 gives the corrected design value of the inside air temperature in terms of the two design variables t_o and U_s. This equation provides a general solution of the cold-wall (or, for summer conditions, the hot-wall) problem and permits graphical interpretation in a form which can be used rapidly and simply by the designer. As an aid in establishing points for the graphical solution, Equation 11 can be written more conveniently in terms of U_s rather than t_a as the unknown,

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[4] ASHVE Research Report No. 1192—Panel Heating and Cooling Performance Studies, by B. F. Raber and F. W. Hutchinson, (ASHVE Transactions, Vol. 48, 1942, p. 35.)

[5] Radiant Energy Exchange as a Factor in Airplane Cabin Heating, by B. F. Raber and F. W. Hutchinson, (Journal of the Aeronautical Sciences, Vol. 11, No. 3, p. 239, July, 1944.)

[6] Loc. Cit. See Note 1.

[7] Loc. Cit. See Note 1.

[8] ASHVE Research Report No. 1193—Radiation as a Factor in the Feeling of Warmth in Convection, Radiator, and Panel Heated Rooms, by F. C. Houghten, Carl Gutberlet, E. C. Hach, (ASHVE Transactions, Vol. 48, 1942, p. 55.)

$$U_s = \frac{3.3\,t_a - 231}{t_a - t_o} \quad \text{........} \quad (12)$$

This equation is solved graphically in Fig. 1.

Example 1: A room 20 ft x 20 ft x 10 ft has two non-transmitting inside walls and two exterior walls ($U = 0.25$) each having a window ($U = 1.13$), the total room glass area being 113.6 sq ft. The floor has a U value of 0.25 (exposed to outside air) and the ceiling is non-transmitting. For an outside temperature of 0 F determine the design inside air temperature and calculate the increased load needed because of the excess radiant loss. By Equation 7,

$$\begin{aligned} Q_t &= (t_a - t_o)\ (113.6 \times 1.13 \\ &\quad + 286.4 \times 0.25 + 400 \times 0.25 \\ &\quad + 400 \times 0 + 400 \times 0) \\ &= (t_a - t_o) \left[\frac{.300}{1600}\right] 1600 \\ &= (t_a - t_o)\ 0.1875 \times 1600 \\ &= (t_a - t_o)\ U_s\ A_s \end{aligned}$$

Then enter Fig. 1 at $U_s = 0.1875$, rise to intersect the curve for $t_o = 0$, move left to read $t_a = 74.2$ F.

The total transmission loss for comfort at $t_o = 0$ is, $Q_t = 74.2 \times 0.1875 \times 1600 = 22{,}250$ Btu/hr, of which $4.2 \times 0.1875 \times 1600 = 1260$ Btu/hr is increased transmission loss needed to compensate for the cold-wall effect; this amounts to a 6 per cent increase over the load needed to maintain a 70 deg air temperature.

Example 2: Consider that the room of the previous example is insulated sufficiently to reduce U_s to 0.10. In this event t_a, from Fig. 1, is found to be 72.2 F. The total heat loss from the room is now $72.2 \times 0.1 \times 1600 = 11{,}550$, a reduction of $\dfrac{22{,}250 - 11{,}550}{22{,}500}$ $= 47.5$ per cent.

The result of *Example 2* is of particular interest because it brings out very clearly the saving in heat load (for equivalent comfort) which can be accomplished by insulation and the rather astonishing fact that the actual saving is greater than the value indicated from a comparison of over-all coefficients alone. Thus, for the case of these two examples, the savings due to reduced U-value is

$$\frac{0.1875 - 0.1000}{0.1875} = 46.7 \text{ per cent}$$

against the actual heat load reduction of 47.5 per cent. The magnitude of the "dividend" due to insulation increases as the difference between the initial and final values of the equivalent over-all coefficient. In a room where the cold-wall effect is not severe, insulation will reduce the heat load in the ratio of over-all coefficients, but in a room having marked cold-wall characteristics the reduction in load will increase more rapidly than the reduction in equivalent over-all coefficient.

Consideration of the foregoing examples will bring out one way in which heating panels, or cast-iron radiators, or any other exposed heated surface can serve to reduce heat load on the system. Aside from the general problem of panel heating, suppose that the room of *Example 1* is to be heated basically by convection, but that a heating element, of whatever form, can be exposed in the room. Assume, further, that this heating unit will be placed near, but not

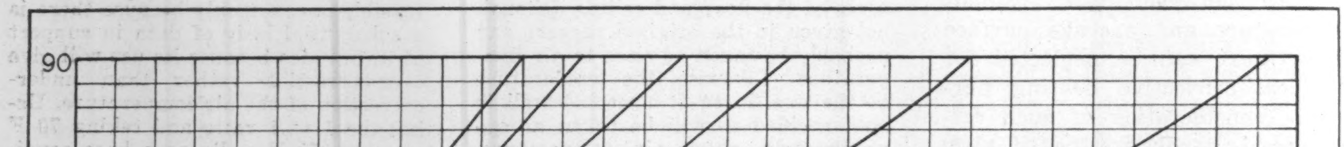

Fig. 1—Graphical evaluation of *coldwall* effect

against, an exterior wall so that it will blank out part of the wall from the occupant's view, but will not alter the inside wall surface temperature. Neglecting radiation, except insofar as it influences the design inside air temperature, and assuming that the exposed heating surface at 185 F consists of an out-set base plate 1 ft in height and running along both exterior walls (area 40 sq ft); calculate the effect of this exposed plate on the design room air temperature and on the room heat loss.

The equivalent surface temperature (aside from the base plate) for the condition of *Example 1* is,

$$t_s = t_a - 0.606 \times 0.1875\, t_a = 0.8864\, t_a$$

With the base plate included, a new t'_s is established.

$$t'_s = t_s A_s + t_p A_p = \frac{0.8864\, t_a 1600 + 185 \times 40}{1600 + 40} = 0.865\, t_a + 4.5$$

Then, substituting this value in the comfort equation,

$$t_a = 140 - 0.865\, t_a - 4.5 = 135.5 - 0.865\, t_a$$

giving,

$$1.865\, t_a = 135.5 \text{ or, } t_a = 72.6 \text{ F.}$$

Thus, use of the base plate has reduced the heating load by

$$\left(\frac{74.2 - 72.6}{74.2}\right) 100 = 2.2 \text{ per cent.}$$

Whatever the output of the base plate may be, it partially meets the total convective load and hence does not require consideration in any particular way. By analogous reasoning it can be readily established that the installation of an inside partition in an underheated room with four exposed walls would increase the feeling of comfort for the same total energy input. Conversely, if a heating system were operating at the rate needed to maintain comfort in a room with four exposed walls, installation of an interior partition would permit realization of equal comfort with a reduced energy input.

PART II. The Inside Combined Film Coefficient

The second of the three fundamental problems listed in the introduction is the one involving convective and radiant energy transfer within an enclosure. As previously mentioned, usual procedure in making load calculations is to group the convection and radiation effects and to take 1.65 Btu/(hr) (sq ft) (deg F) as a combined inside film coefficient, h_{cr}, for transfer from room air to interior surface. The equivalent coefficient can be defined by the equation,

$$h_{cr}\ (t_a - t_1) = h_c\ (t_a - t_1) + h_r\ (t_s - t_1) \quad \ldots\ldots\ldots\ (13)$$

or,

$$h_{cr} = h_c + h_r\ \frac{t_s - t_1}{t_a - t_1} \quad \ldots\ldots\ (14)$$

in which h_c is the coefficient for convective transfer and h_r the equivalent coefficient for radiant transfer; the latter term is defined by the equation,

$$h_r = \frac{0.172\left[\left(\frac{T_s}{100}\right)^4 - \left(\frac{T_1}{100}\right)^4\right]}{t_s - t_r} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ (15)$$

and for the temperatures usually found in rooms heated by radiators, convectors, or warm air systems it can be taken as a constant having the approximate value of 1.01.

The convection coefficient, h_c, varies with position of surface, temperature, and temperature difference, but for a vertical surface under average conditions it can be taken[9] as approximately 0.7 Btu /(hr) (sq ft) (deg F). With these approximations for h_c and h_r the expression for the combined coefficient simplifies to,

$$h_{cr} = 0.7 + \frac{1.01\ (t_s - t_1)}{t_a - t_1} \quad .\ (16)$$

Equation 16 is inexact for the reasons noted, notably that both h_c and h_r have been assigned constant instead of variable values, but it does serve as a rough expression for investigating inaccuracies in the accepted *standard* value of $h_{cr} = 1.65$.

To demonstrate the way in which h_{cr} varies, consider the room which was analyzed in the first example. For this room $t_a = 74.2$ F and $t_s = 65.8$, (from Equation 4) so Equation 16 becomes,

$$h_{cr} = 0.7 + \frac{1.01\,(65.8 - t_{1x})}{74.2 - t_{1x}}$$

where the subscript x refers to a small element of exterior surface at temperature t_{1x} and having a combined film coefficient h_{crx}. This equation does not, of course, provide a true value of the h_{cr} term as it does not take into account shape factors and hence does not properly integrate the radiant exchange, but its application to elements of each different type of surface will at least show the probable range of variation. If an element of glass area is considered (by Equation 3),

$$t_{1g} = 74.2 - 0.606 \times 1.13 \times 74.2 = 74.2 - 50.8 = 23.49$$

so,

$$h_{cr_{glass}} = 0.7 + \frac{1.01\,(65.8 - 23.4)}{74.2 - 23.4} = 0.7 + 0.84 = 1.54$$

Now considering an element of exterior wall surface,

$$t_{1_w} = 74.2 - 0.606 \times 0.25 \times 74.2 = 74.2 - 11.25 = 62.95$$

and

$$h_{cr_{wall}} = 0.7 + \frac{1.01\,(65.8 - 62.95)}{74.2 - 62.95} = 0.7 + 0.26 = 0.96$$

In spite of the multitude of assumptions and approximations which are involved in the above calculations they nonetheless serve to show that a departure of over 50 per cent can occur from the accepted *standard* value of the inside film coefficient, 1.65 Btu/(hr) (sq ft) (deg F).

The intent of this paper is not in any measure to criticize the standard nor to imply that some other value or some other form should be used. Except in the case of structural materials of very small thermal resistance (such as glass or sheet iron) the influence of the inside film coefficient on the over-all coefficient is not great and deviations from the *standard* value do not therefore seriously impair the validity of the resulting overall coefficients. The one very important point which it is desirable to bring to attention is that the *standard* film coefficient cannot be effectively used in analyses which require anything like an accurate investigation of precise surface temperatures and of rates of radiant interchange. The conclusion seems inevitable that for panel heating and cooling problems, or for problems involving the accurate determination of surface temperatures to avoid *condensation,* recourse should be had to the fundamental equations for h_c and for h_r and thence, if h_{cr} is required, to Equation 14.

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[9] Radiation and Convection from Surfaces in Various Positions, by G. B. Wilkes and C. M. F. Peterson. (ASHVE Transactions, Vol. 44, 1938, p. 513.)

The entire preceding discussion is limited to rooms in which surfaces are relatively good absorbers of radiant energy. If surfacing materials of high reflectivity (with respect to radiation of wave length in the infra-red) such as polished copper were used a further decided complication would occur and the *standard* film coefficient would have very little meaning. This case has been given some attention in a previous report from this research project[10].

PART III. The Outside Combined Film Coefficient

In the same manner as for the inside coefficient (Equation 14) a combined outside film coefficient can be defined by the equation,

$$h_{cr} = h_c + h_r \frac{t_1 - t_s}{t_1 - t_a} \; \ldots\ldots (17)$$

where t_1 is now to be interpreted as the temperature of the outside surface, while t_s is now the equivalent temperature of the surround as *seen* by the outside surface. The surround temperature will be taken, as before, as a weighted average of the temperatures of all radiant receivers which are visible to the external wall. The accepted *standard* value of h_{cr} as recommended[11] is 6.0 Btu/(hr)(sq ft)(deg F) and as this is based on an assumed 15 mph wind it can be broken down to radiant and convective parts of approximately 0.8 and 5.2 respectively. In the lower temperature region of interest in design (for determination of maximum heat load) h_r decreases from 1.01 to approximately 0.6. Then Equation 17 becomes,

$$h_{cr} = 5.2 + 0.6 \frac{t_1 - t_s}{t_1 - t_o} \; \ldots\ldots (18)$$

Again using the data of *Example 1,* the calculated outside surface temperatures of glass and of wall are given by,

$$\frac{t_{1_g} - t_o}{t_a - t_o} = \frac{1/6.0}{1/1.13} = \frac{1.13}{6.0}$$

or,

$$t_{1_g} = 0.188 \times 74.2 = 13.9 \text{ deg}$$

$$\text{and similarly } t_w = \frac{0.25}{6.0} \times 74.2 = 3.1 \text{ F}$$

Then substituting into equation 18,

$$h_{cr_{glass}} = 5.2 + 0.6 \frac{13.9 - t_s}{13.9}$$

and

$$h_{cr_{wall}} = 5.2 + 0.6 \frac{3.1 - t_s}{3.1}$$

Since the analysis is being carried out for conditions of maximum load, the assumption will be made that it is a clear night and that the equivalent radiative sky temperature[12] is -40 F. Likewise a first assumption will be made that 50 per cent of the radiant energy leaving the window surface and the wall surface is received on the earth or on earthbound surfaces; for three conditions, taking the earth temperature as 0 F, the value of t_s becomes

$$\frac{0 + (-40°)}{2} = -20 \text{ F and}$$

$$h_{cr_{glass}} = 5.2 + 0.6 \times 2.44 = 5.2 + 1.5 = 6.7 \text{ Btu/(hr) (sq ft) (deg F)}$$

$$h_{cr_{wall}} = 5.2 + 0.6 \times 7.5 = 5.2 + 4.5 = 9.7 \text{ Btu/(hr) (sq ft) (deg F)}$$

For a horizontal skylight which *sees* only the clear night sky,

$$h_{cr_{skylight}} = 5.2 + 0.6 \frac{13.9 + 40}{13.9} = 5.2 + 2.3 = 7.5 \text{ Btu/(hr) (sq ft) (deg F)}$$

For a flat roof with $U = 0.25$ (conventional) and $t_a = 74.2$,

$$h_{cr_{roof}} = 5.2 + 0.6 \frac{3.1 + 4.0}{3.1} = 5.2 + 8.3 = 13.5 \text{ Btu/(hr) (sq ft) (deg F)}$$

The departure of the above values from the *standard* value of 6.0 Btu/(hr)(sq ft)(deg F) is sufficiently pronounced to indicate that great need exists for more careful consideration of radiation when determining outside nocturnal surface temperatures and for revising the over-all coefficient when used under conditions which give severe nocturnal exposures. In most design problems a heating plant large enough to care for the maximum load occurring during daylight hours will adequately serve its purpose. In other cases, however, need exists for meeting the maximum nocturnal as well as daytime loads.

Again attention is directed to the fact that use of the so-called standard values of either the inside or outside combined coefficient is unlikely, under usual conditions, to result in serious error. The vital fact remains, however, that deviations of 50 per cent to 100 per cent from the standard values *do* occur in normal practice and must therefore be given proper consideration if conditions are such that the films are controlling factors in determining the over-all thermal resistance.

Summary

The present paper has been prepared as a progress report on the cooperative research on panel heating and cooling which is being conducted at the University of California in cooperation with the American Society of Heating and Ventilating Engineers and under the auspices of the ASHVE Technical Advisory Committee on Radiation and Comfort. Basically, however, this paper is intended not as a report on laboratory progress on the panel project but as a gathering of notes relative to the fundamentals of load determination for heating systems as influenced by radiant exchange.

Although intended as a project for obtaining and correlating data leading to the development of methods for analyzing heating and cooling systems which are primarily of the radiant type, the panel research project has necessarily been concerned with the fundamental problems of radiant exchange. These problems occur in radiator, convector, and warm air heating systems no less than in systems of the radiant or panel type. To emphasize this broader, application of common principles and of common solutions to recurring basic problems the present report has been somewhat divorced from the specialized title of the cooperative project.

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[10] Loc. Cit. See Note 4.

[11] Heating, Ventilating, Air Conditioning Guide, 1944, p. 91.

[12] The Calculation of Heat Transmission, by Fishenden and Saunders. H. M. Stationery Office, London, 1932, p. 37.)

Part I of this report proposes a rational procedure for determining the design inside air temperature for an enclosure heated by any conventional system of the convective type. The proposed method is adaptable to graphical solution (Fig. 1) and thereby permits realization of a simple, general, yet accurate determination beyond the power of existing empirical correction data.

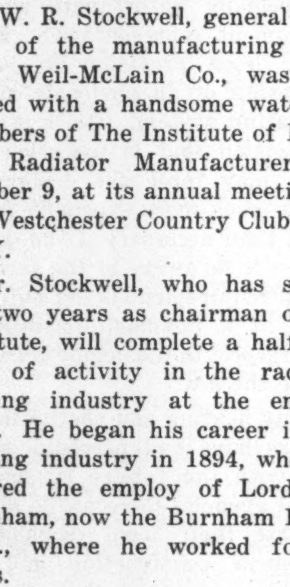
Parts II and III are devoted to an examination of the inside and outside combined surface heat transfer coefficients for convection and for radiation. The values of combined coefficients as recommended by the ASHVE Guide are not questioned when their use is restricted to their intended purpose, *viz.*, load determination for convective-type heating systems. But when surface temperatures are to be accurately determined or when radiant exchange analyses are required (as in panel heating design) then the large deviations (50 per cent to 100 per cent) which may occur between the actual combined coefficients and the *standard* combined coefficients become worthy of careful attention.

W. R. STOCKWELL HONORED

In honor of his 50 years of service in the radiator heating industry, W. R. Stockwell, general manager of the manufacturing division, Weil-McLain Co., was presented with a handsome watch by members of The Institute of Boiler and Radiator Manufacturers on October 9, at its annual meeting at the Westchester Country Club, Rye, N. Y.

Mr. Stockwell, who has served for two years as chairman of the institute, will complete a half century of activity in the radiator heating industry at the end of 1944. He began his career in the heating industry in 1894, when he entered the employ of Lord and Burnham, now the Burnham Boiler Corp., where he worked for 24 years.

For the last 26 years Mr. Stockwell has been general manager of the manufacturing division of the Weil-McLain Co.'s plants at Michigan City, Ind., and Erie, Pa.



W. R. Stockwell

Mr. Stockwell was elected a Life Member of the American Society of Heating and Ventilating Engineers in 1939. He is a member of the Engineers Club of New York, the Uptown Club of New York, the Chicago Athletic Club, and the Lake Shore Athletic Club.

He is chairman of the industry committee of the boiler and radiator industry for both the OPA and the WPB.

Mr. and Mrs. Stockwell have five children, three of whom are in the service, one a lieutenant in the Navy and two captains in the Army.

A. B. BANOWSKY IN NEW POST

A. B. Banowsky, after 13 years with the United Gas System, Houston, Tex., was recently appointed manager, Retail Division, Payne Furnace and Supply Co., Inc., Beverly Hills, Calif.

Mr. Banowsky has been acting chairman of the AGA subcommittee on Approval Requirements for Central Heating Appliances, of which he has been a member for five years, and for the past three years he has been chairman of the Duct Furnace Sub-committee. Before his new assignment, he specialized in sales and installation of gas heating and air conditioning. He was also commercial and industrial sales manager for the United Gas System.

AXEMAN-ANDERSON ORGANIZE

Announcement has just been made of the organization of Axeman-Anderson Associates, 233 West St., Williamsport, Pa., by J. E. Axeman and W. S. Anderson Jr. Both principals are well known in the heating industry through their recent association with the Spencer Heater Div. of the Aviation Corp.

Mr. Axeman spent 20 years with the Spencer company immediately after his graduation from Penn State College and he has served in various capacities and recently was its general sales manager. He has been active in the Steel Heating Boiler Institute and is a member of the Steel Boiler Advisory Committee of WPB.

Mr. Anderson was associated with Spencer for 12 years as chief engineer and previously was with Bigelow Co. and Riley Stoker Corp. He was educated at Stevens Institute of Technology and the mechanical engineering school at Columbia University.

The new company announces its intention of carrying on research work for the anthracite industry in the development of heating equipment using the recently announced basic principal for burning this kind of fuel.

GAS POISONING

According to figures compiled by the National Safety Council, Chicago, nearly half of the fatalities from poison gas occurred in homes in 1943. The gas, carbon monoxide, that caused the majority of deaths is odorless, tasteless, and colorless. In amounts as small as 0.15 of 1 per cent concentration, it causes death and in a concentration of 1 per cent it causes death in only two minutes.

Around the home carbon monoxide is produced by:

1. Incomplete combustion of fuels such as coal, oil, or wood.
2. Automobile exhaust.
3. Utility gas (although before combustion the concentration of carbon monoxide in utility gas is high, the unpleasant odor of the gas acts as a warning of any leaks. The greatest danger from this type of gas is explosions).

Control of Industrial Atmospheres

Dusts, Fumes, Mists, Vapors and Gases

By W. N. Witheridge, M.S.,* Detroit, Mich.

MEMBERS OF this Society who have their eyes on the opportunities of the immediate future, certainly have noticed with keen interest the increasing number of articles on dust control, atmospheric pollution, industrial air cleaning, airborne product recovery, atmospheric explosion hazards, health hazards and many other problems created by the existence of dusts, fumes, mists, vapors or gases in the air.

The point of interest is not that such problems exist, but that more exacting demands for the control of air quality are being made by the engineers' industrial clients. This trend will increase as the public learns more about the possibilities of improving its atmospheric environment, both within and in the neighborhood of industrial plants. It is inevitable, of course, during a period when the public mind is learning to expect higher standards of working and environmental conditions, that some ridiculously severe demands will be made upon engineering skill, and upon the resources of industrial property owners. Nevertheless, the heating and ventilating engineer is quick to realize that any widespread desire to improve the atmospheric environment during working hours is a trend in the right direction, and calls for intelligent and vigorously practical guidance.

This paper is prompted by the author's experience in observing the performance of industrial ventilating systems in a large industrial area for nearly a decade. It is a frank discussion of a few current administrative and technical problems confronting ventilating engineers who devise the equipment for controlling air contaminants produced by industrial processes.

SUMMARY—A presentation of the problems encountered by the heating and ventilating engineer in the control of industrial atmospheres is given. Common causes of failure in industrial ventilation systems are presented in the light of the author's experience. He emphasizes that the basis of ventilation standards and the methods to be used in determining whether an installation complies with given requirements should be fully investigated before guarantees of performance are given.

The observations presented here have been seasoned by the personal experiences of many of the engineers and contractors serving the Detroit metropolitan area. We are greatly indebted to them for their practical advice and cooperation, and for the valuable opportunity of seeing first-hand their effective solutions of many troublesome ventilating problems.

State Laws and City Ordinances

Government agencies throughout the country are becoming more and more interested in writing codes, regulations, standards, ordinances or laws dealing with the control of airborne industrial diseases. Such codes cannot be written without directly affecting the work of heating and ventilating engineers who conduct their business in the city or state covered thereby.

The existing factory inspection laws of some states contain erroneous clauses or misleading provisions concerning technical engineering matters. They are details that can only be amended by the legislature in most cases—details that deserve constant review and revision in order to keep pace with developments in the heating and ventilating sciences. From a realistic viewpoint, its does not seem to be good legal administration to expect a legislature to take over the essentially continuous job of keeping ventilation engineering standards up-to-date. Responsibility for such changes might better be delegated to a recognized and non-partisan group of practical specialists who are required to open their important decisions to public hearings.

Although some of these erroneous laws are seldom enforced, they serve to create disrespect for other very desirable provisions; and even though they are not enforced, they cause a great deal of harm to the public and to the heating and ventilating profession. It is especially unfortunate when a government representative cites a faulty legal provision to justify the design of an obviously useless ventilating system. Quite possibly a provision that is too severe, by error, may force the designer to plan a much more expensive installation than necessary. If he doesn't happen to be aware of the fact that such a requirement is not enforced, he is at a financial disadvantage with respect to his competitors who ignore the law.

Many heating and ventilating engineers have had personal experience with the failure of separate official agencies to reconcile and coordinate their legal demands on equipment construction and performance, whenever their jurisdictions converge upon a given installation for atmospheric control. A workable remedy for this condition is not likely to appear in any case of such conflict until the agencies concerned are ready to agree, first, that such confusion exists; second, that it begets a regrettable waste of time and money; and third, that joint efforts of the agencies are desirable. This is one of the problems that deserves the thoughtful attention of professional, non-political groups such as the ASHVE.

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*Director and Chief Engineer, Bureau of Industrial Hygiene, Detroit Department of Health. Chairman, Committee on Industrial Ventilation, National Conference of Governmental Industrial Hygienists. Member ASHVE.

For presentation at the 51st Annual Meeting of the American Society of Heating and Ventilating Engineers, Boston, Mass., January 1945.

Ventilation Standards and Performance Guarantees

The use of performance testing instruments and air sampling devices of all types is becoming more common in industry, both as a routine check on existing equipment, and for the purpose of determining the initial performance of a new installation. They are also recognized essentials in the elaborate collection of apparatus carried around by the industrial hygiene engineer.

The ventilating engineer must be deeply interested in the standards, legal or otherwise, against which his equipment will be compared. He may have learned on several occasions that such comparisons can be made by persons who have a duty to perform, but who do not have the necessary engineering background, or the right of legal discretion to make sound modern interpretations of an old law many years out of date.

The ventilating engineer must not be too quick to guarantee that his new system will pass health or labor department tests, when such are made, unless he is fully aware of the nature of such tests, and has good evidence that his equipment will comply. Some of the standards of air quality are necessarily quite severe. On the other hand, as soon as he is certain that he can deliver a successful product, he will include a guarantee to meet existing standards to support his confidence in good results.

In some districts, as in Detroit, he may voluntarily submit his plans to the official agency to obtain an approval or appraisal in advance of installation, or he may arrange for field tests on an experimental basis under actual operating conditions by agreement with his client, particularly if the proposal is unusual or of questionable merit. In a very few parts of the country, the agency enforcing minimum standards must approve the plans for all new or reconstructed industrial ventilating equipment prior to installation. In such cases, it is quite essential that the examining group issue clear, specific standards or instructions for the guidance of designers. The latter system cannot operate fairly unless the examining group is large enough to avoid time-consuming delays and is carefully staffed with competent engineers.

The desire of some engineers to assure their customers that health standards will be maintained by their equipment has made them acutely aware of the inadequacy or confusing nature of some of these standards. The designer takes little comfort in the knowledge that 10 cubic meters of air must contain no more than 1.5 milligrams of lead dust after his new ventilating system is put into operation. Instead he needs to know what this means in terms of air cleaning load—just as he needs a generous amount of data to determine heating and cooling loads.

What the ventilating engineer should know (and this is where tremendous opportunities for research now exist) are such items as the airflow quantity in cubic feet per minute required per machine, worker, equipment area or other appropriate production unit; the "capture" velocity or controlling air velocity in linear feet per minute under many operating conditions; or the dilution factor for general ventilation (number of times an existing dust or vapor concentration must be reduced, which requires both before and after air concentration data). The maximum allowable concentration (MAC) of dust in the air recirculated to a room through an air cleaner can be of use if the air cleaner has been properly rated on this basis.

Maximum Allowable Concentrations

It is the author's personal belief that engineers allied with the industrial hygiene field owe a long overdue apology to the heating and ventilating profession for their failure, so many times in the past, to state in readily digestible terms what the ventilating engineer needs or desires to know about the air contaminants he is asked to control. He is asked to reduce the concentration of X dust down to Y million particles per cubic foot of air, and then told that after he makes his first attempt, someone will return with an electrostatic precipitator and anemometer to find fault with his installation. Rarely do we bother to advise him in advance that the required air purity is nearly equal to that found outdoors on a clear day in that vicinity—or some equally revealing information.

Maximum allowable concentrations in air of substances that are dangerous to breathe must be translated into workable standards, particularly when industrial hygienists jealously maintain that air testing for extremely small amounts of dusts, fumes, or gases is a highly technical procedure. In fact, the ventilating engineer has no intention of becoming also an analytical chemist. Furthermore, he cannot go into his fan table with a maximum allowable concentration figure, and come out with anything but a headache. This we have learned forcibly from engineers who have no time nor desire to juggle chemical equations.

The best way to get prompt, sure-footed results is to specify a ventilation rate for a given hazard, exposure, or industrial process that has a good chance of keeping the air contamination below the accepted *maximum allowable concentration.*

If this rate proves to be excessive or inadequate after repeated tests over a wide variety of operating conditions, in numerous plants under different supervisory and labor conditions, and by independent investigators, a new standard obviously is required. Development of these ventilation standards should be the joint, carefully planned projects of the ASHVE, ASA (*American Standards Association*), AIHA (*American Industrial Hygiene Association*), NCGIH (*National Conference of Governmental Industrial Hygienists*), and other interested professional or semi-official groups.

Seeing Is Believing

The non-technical person, the *layman,* including both employers and employees, have really very little alternative but to judge health hazards by what they see, sense, or experience for themselves. Eventually they are in the proper frame of mind to learn by the mistakes and difficulties of others, but at the outset they learn by the most potent method available—personal experience.

This is a distinct handicap in the field of occupational health hazards, and especially troublesome when dealing with microscopic and sub-microscopic matter such as dusts, fumes, mists, vapors and gases. Why? Because many of the dangerous air contaminants make absolutely no impression on our physical senses until the damage has been done. Workers can *carry on* for months and years under hazardous concentrations of silica dust without any discomfort or evidence of harm and finally they seem to have suddenly developed a case of disabling silicosis. They may, for instance, resent very bitterly a suggestion that they be transferred from an interesting, good paying job that creates invisible but dangerous concentrations of lead fume, because they have not yet become ill with lead poisoning. Or they may actually like the odor of the vapors of a new organic solvent which does a much better production job, and be quite unaware of the possible effects on their health of inhaling these vapors in small quantities over a long period of time. All these workers and their employers may not, as yet, have personally experienced the suffering and cost of occupational disease.

It is also a point of importance to the industrial ventilating engineer to know that the customers and users of his equipment are not always sold on the idea of having it around. Perhaps he was called in to design or install a ventilating system because a government inspector so ordered. Perhaps top management is fully aware of the dangers of a certain operation, and both the men and their supervisors find ventilating equipment already installed as soon as they arrive on their new jobs. But perhaps these men find that the type of mechanical ventilating equipment devised slows up their production rates and they notice no serious discomfort or ill feeling when they fail to turn on the fan. Someone in the plant may eagerly promote the idea that the ventilating engineer dreamed-up a useless system with a white-elephant future. The next job of ventilation in that plant goes to another designer.

The Use Factor

Why is the foregoing situation worthy of comment? Because the ventilating engineer who designs a system for the control of a certain dust, fume, mist, vapor or gas must know whether that substance is visible, irritating, offensive, or whether it has no effect whatever upon the human senses at the concentrations present in the plant air.

If his system produces an obvious and highly welcome improvement in the factory atmosphere, the users will put up with some mechanical interference on their jobs in exchange for their health or comfort. If, however, his equipment has the essentially thankless job of keeping an odorless gas or an invisible fume under control, he must take extra pains to design it with as little interference with normal plant operations as is practically possible to achieve.

Observed many times in the Detroit area has been the scrapping of expensive process ventilating equipment that failed to take serious account of (to use the author's own terminology) ***the silent sabotage of a very low Use Factor.*** It might be a mechanically ingenious design, built to endure, pleasing in appearance and efficient in operation, but such a confounded nuisance to operate in a mass production plant that its ***Use Factor*** is strictly zero.

Common Causes of Failure

Experiences with investigations in Detroit in over 2500 industrial plants have revealed all of the following causes of failure or waste in ventilating equipment for the control of industrial atmospheres. These difficulties are a matter of record, and are not simply a tabulation of potential faults.

1. Inadequate air supply for an exhaust system creating an air-bound room. This is chiefly a winter problem in the Detroit climate and often occurs when a system is installed in summer with plenty of open windows and doors, and no check is made of its performance under simulated winter conditions before the installation is accepted.
2. Short-circuiting of the ventilating fan or hood by the effect of an open window, door, skylight or stack near it, a condition which might be called "ventilating the outdoors." The frequency with which this fault occurs is amazing.
3. Locating ventilated equipment in the vicinity of open windows permitting entrance of powerful drafts of air which impose an almost impossible task upon the ventilation. This is very common with solvent type degreasers and other open top ventilated tanks.
4. Exhaust hood located too far from source of air contaminant. It seems very difficult for plant operators and workers to appreciate the rapid deterioration of air velocity with distance from an exhaust opening. The fact that air moves from all directions toward an exhaust opening seems to be "one of the wonders of the world."
5. Use of general ventilation with resultant waste of heat, when a local exhaust system handling a small amount of air would be practicable.
6. Backward operation of a centrifugal fan. Many persons in industry are not aware of the fact that a centrifugal fan, as opposed to an axial flow fan, will move air in only one direction (from the center outward) whether it runs forward or backward. Its capacity in reverse is, of course, greatly reduced.
7. Excessively high duct velocities when transport of particulate matter is of no concern. Conversely, insufficient transport velocities in ducts carrying dust. The accumulation of flammable dust is especially dangerous.
8. Sheet metal construction that ignores present knowledge of low resistance design.
9. Substantial underestimation of the pressure losses of an exhaust system. This occurs often with flexible-type ducts.
10. Construction of ducts and hoods that are practically impossible to clean and failure to use convenient cleanouts when provided.
11. Failure to protect all parts of the ventilating system against rapid destruction by corrosive atmospheres.
12. Selection of fans by *free-flow* ratings. Even axial flow fans as used in industry for general ventilation very seldom operate under free-flow conditions.
13. Excessive leakage of dusts or gases from positive pressure ducts that could readily be operated under suction to reverse the direction of leakage. Industrial equipment is bound to develop leaks continually.
14. Failure to provide enclosures, baffles, or windbreakers whenever possible to reduce the quantity of air to be moved.
15. Overloading an existing system by adding exhaust openings not contemplated in design.
16. Design of a system to create a specified static pressure instead of the minimum successful rate of airflow.
17. Complicated designs of local exhaust units that are quickly scrapped.

18. Drawing dusts, fumes or gases toward, instead of away from the worker's breathing zone.

19. Blowing unheated or untempered make-up air at workers during the winter season.

20. Recontaminating plant air by discharging contaminant outdoors at a point where it can easily return to the plant.

21. Recirculating contaminated air from an exhaust system back to the factory atmosphere without effective cleaning.

22. Use of the wrong type or size of air cleaner. This includes use of too small or too large cyclones, insufficient filtering area, wet collection of dusts that resist wetting, single stage collection on a very heavy dust load with a great range of particle sizes, and (quite unbelievable!) ozone generators still being installed for the purpose of eliminating carbon monoxide!

A complete listing of similar causes of failure observed to date includes about 50 items.

Sub-Standard Installations

One of the *bread-and-butter* problems confronting the conscientious and competent ventilating engineer is the loss of an order to a concern that specifies equipment which he knows has little chance of complying fully with health or labor department requirements. Perhaps it is known that enforcement of industrial health standards is inadequate or very tardy in a certain city or state and therefore the industrial customer takes a chance on a less costly or makeshift installation which he hopes will pass government inspection. Possibly the customer may gamble on the fact that the installation will never be given more than a casual, visual, or hasty visit by an inspector eager to credit him with a compliance with his official order. Occasionally the designer takes the attitude that the government-sponsored standard is sky-high and nonsense. (Unfortunately this is true of some laws as was pointed out earlier.)

Ventilating engineers who encounter this situation throughout the country are anxious to see better enforcement of minimum standards—those which they personally know to be quite necessary if honest value is to be given for the customers' ventilation dollar.

All-Purpose Ventilating Equipment

The author and his associates have observed an almost monotonous tendency on the part of many plant operators to approach an air handling problem as if it were quite as elementary as the opening of a bedroom window. They are easy prey to the ill-advised person who promotes his product as the universal solution for all problems of factory ventilation. They are the customers who are easily misled and then become disgusted when mention is made of *ventilation* or *ventilating engineers*.

In favor of all-purpose equipment there is the *expert* who always recommends a fan in the wall and may remind the customer that he has done so for years and years. There is also the promoter of a dust collector that works on everything, including vapors and gases. There is the natural draft enthusiast who always finds a dependable wind around the corner. There is the canopy hood expert who puts a hood over every problem and expects the air to be self-propelling in an exclusively upward direction; and the small-slot, high velocity, low volume specialist who seems to be thinking only in terms of his household vacuum cleaner. All such men perhaps are victims of the one-track mind rather than possessors of unethical tendencies. Still they manage to find enough customers who want something for practically nothing, and, in the end, much of their work has to be undone before a genuine health hazard can be brought under control. As a matter of fact, their existence is one of the reasons why the ASHVE is necessary to protect the reputation and interests of the heating and ventilating profession.

Combined Safety and Health Problems

There has always seemed to be greater respect for the explosion hazards carried by industrial atmospheres than for the hazards to the health of workers breathing the same air. In the usual manner, knowledge of such possibilities for accident is obtained by suffering many tragic and costly industrial explosions that are immediately and drastically impressive. At present, it is much easier to get an industrial executive to eliminate the explosion hazard in the handling of a volatile liquid than it is to make him concerned about the slow and quiet development of an occupational disease to which the workers might also be exposed. In fact, if the explosion hazard is controlled, he is quite anxious to consider the health hazard equally under control.

Unfortunately, it so happens that the concentrations of flammable vapors that are kept to ¼ or 1/5 of the lower explosive limit to provide a reasonable safety factor, are still not so low as they must be if the vapor-laden atmosphere is breathed by human beings. There are very few exceptions to this statement. The lower explosive limits of most vapors are above 1 per cent by volume (10,000 parts per million parts of air). If 1/5 of the lower explosive limit is permitted, 0.2 per cent or 2000 parts per million would be a safe concentration for such vapors from the fire standpoint. From the health standpoint, the permissible concentration for industrially common vapors ranges chiefly between 25 and 500 parts per million, with very few that can be tolerated above 1000 parts per million. This is one of the lessons that the ventilation-conscious safety engineer must learn if he has the responsibility for, or interest in, the health as well as safety of his workers.

Recirculation of Factory Air

The current necessity for fuel conservation has brought into sharp relief the demands for permission to recirculate to the general factory atmosphere the air used to remove excessive process dusts or other air contaminants. Some of the most important recent advances in industrial ventilation technique have occurred in this direction. Such installations impose the most severe demands upon industrial air cleaners of all types when the air they discharge must be clean enough to breathe all day without harm to health. Many air contaminants of a highly dangerous nature create atmospheres that defy the best commercially practical air cleaners yet devised, and consequently, must be discharged outdoors through high stacks along with valuable heat units. Collectors with a stated 99 per cent efficiency may still pass enough of some of these dangerous contaminants to make the air unfit for breathing over long periods of time. In general, the hazardous gases, vapors and fumes are most difficult to remove while the dusts and mists offer the best opportunities for recirculating systems. Most manufacturers of air cleaners are well aware of the limitations of their equipment and are very anxious that their products should not be subjected to hopelessly severe operating demands.

Neighborhood Nuisances

The Bureau of Industrial Hygiene in Detroit, as is also true of similar investigating agencies in other communities, is keenly aware of the perennial conflict between industrial buildings and their commercial and residential neighbors for relief from allegedly offensive, sickening, irritating or destructive air contaminants discharged by a ventilating system designed for the benefit of plant occupants. In fact, as time goes on, conditions inside factories are getting better and better and surrounding atmospheres are getting more and more contaminated. This indeed presents a very worthwhile problem to the designer and manufacturer of air cleaning equipment for the collection of dusts, fumes, mists, vapors or gases.

Anticipating New Control Problems

The new era of synthetic organic chemicals developed to replace the shortages in our material resources already has multiplied many times the instances where buildings and their mechanical equipment become unable to cope with man-made chemical-bearing atmospheres. It is not easy for the designer to keep in step with the constant changes in the materials of industrial production. For example, the heating and ventilating engineer may have installed a very desirable modern industrial air conditioning plant which quite unintentionally picks up the vapors of a new offensive chemical and distributes them to every corner of the plant. In July the dust collecting engineer may install a new emergency exhaust system that completely overwhelms the existing heating plant in December. The architectural engineer may design a new industrial building that soon must be partially torn down to accommodate air control equipment which, as the ventilating engineer might claim, in retrospect, was obviously necessary.

Although ventilating engineers certainly cannot be held responsible for production changes that affect plant atmospheres, those who can advise and warn their clients or employers about the air conditioning aspects of new processes, are today in a most enviable position. In fact, if the ventilating engineer simply relays the information he has obtained from known industrial hygiene sources in his community, he is credited with knowing the latest developments in his own field.

The Industrial Hygiene Engineer

The industrial hygiene profession is sometimes loosely divided into two major groups: medical and engineering. To those who design, buy and sell industrial ventilation, this fact is important. Ventilation is perhaps the most useful exposure control method at the disposal of the industrial hygiene engineer. From 50 to 75 per cent of all occupational disease hazards encountered in his daily work (excluding skin diseases) terminate with the requirement of some form of ventilation.

In some organizations an industrial hygiene *engineer* is not necessarily an engineer, and seldom has he entered the field as a ventilation engineer. He may be basically a sanitary engineer, civil engineer, chemical engineer, chemist, biochemist, physicist, electrical engineer, mechanical engineer, ventilating engineer, or any other technically trained person who has a valuable background to offer the field of industrial hygiene, and who would not be termed a medical industrial hygienist. Industrial hygiene needs all these variously specialized personnel to carry out an effective study of industrial health problems and to arrive at successful methods of control.

Thus, technical ventilating problems daily confront all types of industrial hygiene engineers who may be called upon to approve or disapprove existing or proposed methods of controlling an airborne hazard. They may be required to do this as government officials responsible for safe working conditions under their jurisdiction. As a group, therefore, all industrial hygiene engineers must learn as much as they can about the possibilities and limitations of control by ventilation so as to avoid costly errors of judgment and counsel.

At the same time it is desirable for mechanical engineers who specialize in air conditioning to learn, during their university training, of the ventilation problems related to industrial hygiene. Until very recently it was quite natural, because of limited course opportunities, that many students passed over the possibilities of this specialty as not even being within the realm of the engineer. It is gratifying to note that more engineering schools are beginning to carry this subject in their heating and ventilating curricula.

Collaboration With the ASHVE

The Society represents the resources and talents of hundreds of engineers who have learned to handle the "thin air" with confidence and respect.

On the other hand, there are so few ventilating engineers available for full-time industrial hygiene work that many of the engineering investigations and studies on air handling problems associated with industrial health hazards are carried out by industrial hygiene engineers in various parts of the country who admittedly have only a casual background in the fundamentals of ventilation engineering. This statement must not be misunderstood. In a sense, these efforts of members of other professions to solve our problems have been most healthy and valuable additions to the information at our command. Nevertheless, it is believed that the most reliable ventilation engineering research can be conducted by or with engineers who have devoted their years of experience to this field.

It is not wise for any technical group to undertake the study of special problems in industrial ventilation without tapping and exhausting the existing resources of the ASHVE. One of the serious difficulties we all experience in following the rapid development of industrial hygiene engineering technics, is the very much scattered and uncoordinated state of our present efforts in ventilation research.

There are many industrial hygienists who are quite unaware of the excellent and potential services afforded by the Research Laboratory of this Society, coordinated with other research and educational institutions. Conversely, it is believed that a large number of the Society's members do not know of the nation-wide and local influences that industrial hygienists are exerting on their current heating and ventilating activities.

The author firmly believes that there exists an urgent need for more intimate relationship between the ASHVE and those public health and industrial hygiene engineers who use ventilation as a major weapon in the prevention of occupational disease.

CLIMATE AND THE ENERGY OF NATIONS

Major S. F. Markham, in the American edition of his book, Climate and the Energy of Nations,* presents an interesting and plausible theory to explain the development of civilization, and the relative greatness of nations. It is his argument, "that where indoor temperatures are above 60 F and below 76 F, and relative humidities are between 40 per cent and 70 per cent, men work harder and more efficiently than at temperatures and humidities outside this zone."

In a remarkably brief and yet complete review of ancient history, it is shown that most of the early civilizations developed in areas favored by ideal climatic conditions. As man discovered better and more efficient means of heating his home, the centers of civilization gradually moved northward into colder climates. Today the leading countries of the world are to be found in these parts of the earth where the mean temperature of the warmest month does not exceed 75 F, and the mean temperature of the coldest month is not lower than 10 F to 30 F. However, the possession of such a climate does not, in itself, assure national greatness.

Lacking any universally recognized units, the author has measured the energy of most of the nations of the world in terms of: (1) death rates, (2) infantile mortality, (3) national income per head, and (4) foreign trade per head. The tabulated results of this analysis are most interesting.

As a means of correlating national energy and climate, energy indices and isotherms are plotted on several groups of maps. In each group the same correlation is evident; the nations of greatest energy are those which have favorable climates and adequate fuel.

Several chapters of this American edition are devoted to a similar analysis of the energy of the United States, state by state. For this survey, infantile mortality, intelligence and culture, and income per head are used as indices. The results of the survey are plotted, and again a striking similarity is found between the energy and climate maps.

The author points out that while centers of civilization have moved from ideal to cold climates, they have never moved toward warmer areas. This is because of man's inability in the past to control hot or humid conditions. While it is true that such control is available today, its application is still extremely limited, and it is doubtful if it will ever become as commonplace as winter heating.

In reading this book, one cannot help but sense the vast amount of preliminary research which the author must have done. Climatological data, economic data, and vital statistics have been gathered from every corner of the globe. Quotations and references throughout the book testify to the author's broad knowledge of the literature dealing with every phase of the subject. In spite of the statistics and references, the book is easily read and thoroughly enjoyable. Anyone in the heating and air conditioning industry seeking assurance of the importance of his work should not fail to read this book.—Clark M. Humphreys, ASHVE Research Laboratory, Cleveland, Ohio.

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*Oxford University Press, Inc., New York, $3.50, 226 pp., 5½x8½ in.

REVIEW OF MAJOR S. F. MARKHAM'S "CLIMATE AND THE ENERGY OF NATIONS"

In the past one hundred and fifty years the increase in population in Europe alone was from two hundred million to six hundred million —more than twice the increase of the preceding million years. This increase could hardly be attributed either to climate or the migration of races or the energy of nations induced by a more salubrious climate, the reason being that during this period of time the climate has not changed. Interesting as Major Markham's book is from an historical angle, it seems to me to fall far short of a sound theory for the development of races. For those interested in air conditioning, it is splendid propaganda and, if the theory were sound, then undoubtedly the influx of our technically minded generation into the air conditioning industry would overwhelm us with competition.

Shelters and chimneys and an abundance of water for utilitarian purposes and hot baths all play a major part in the author's analysis of our economic advancement, but, to my mind, the whole issue is confused. The predominance of Greece, later submerged by its conquest by the Romans, then the decline of Rome and the rise of the Hun, the Northern and then the Western migrations show a rise and fall that is inconsistent with any energy curve, so that something other than climate must be visualized as a basis for an analysis of our tremendous progress and our tremendous increase in numbers in the past one hundred and fifty years. Actually, historically, the Roman prosperity was due, not to the baths and comforts cited by the author, but to the fact that Roman civilization, taking a good bit of its knowledge from Greek civilization, was able to conquer sufficient numbers of people whose enslavement allowed the Romans leisure to pursue their arts and their pleasures and their warlike domination. I feel that Parmlee Prentice in *Hunger and History* gives us much sounder reasons for the development of the race, its increase in numbers, and its much greater prosperity. In order to progress, people must have leisure to do something other than strive for the essentials of living. It was only when we advanced technologically to the point of using draft animals or machinery that one man could provide more than sufficient food for himself. Until this occurred, the world and all the people in it faced starvation every day, and the migration into unsettled sections of the world in large numbers was only possible when husbandry and the cultivation of essentials for living could be accomplished in the short growing time available in sufficient quantities to support the population through the inclement seasons when growing and harvesting were impossible.

Major Markham, in his emphasis on the value of coal in the development of our modern civilization, certainly stretches a point when he says that the control of cold and damp had a marked effect on the rapid development of the races, as indicated in the use of coal, for instance, in England. It is common knowledge that the use of coal for the production of steam to operate machinery to produce more goods with less labor was the main cause for the advancement of the English people and that the amelioration of indoor conditions due to heating has, even today, not been advanced to a point in England which would warrant too much enthusiasm.

For thousands and hundreds of thousands of years, the vast majority of the population lived in tropical or semi-tropical climates. Even today half of the population of the world is in India, China, and the adjoining states such as Burma and part of the Dutch East Indies, where the raising of food is possible at all seasons of the year and where the need of providing shelters and clothing is negligible. It is true that the wasting of the soil and the elimination of timber has kept this excessively dense population close to starving, whereas the migration away from these countries, which began to take place in the very earliest times, only started to multiply when methods of agriculture and means of tilling the soil advanced to very high degrees of efficiency.

Both Parmlee Prentice and Lewis Mumford place the invention of modern harness and the shoeing of horses, which only occurred, strange as it seems, in the thirteenth century, as the major inventions of all time up to that particular point. It seems strange that these inventions occurred so late, but, up to the time that man discovered that the original harness employed on horses practically strangled the animals so that they could not pull more than about four hundred pounds, cultivation of the soils by means of draft animals was almost negligible. Even after the split harness, or the breast strap, was invented until iron shoes were on horses, they still were not able to work to maximum advantage. It is difficult to realize how nearly the world starved for so many hundreds of thousands of years and how little leisure the world had until it was able to provide for itself in only a small portion of the total working time, so that part of the population could devote itself to the increase of knowledge, the development of the technology required to produce goods, and the ability to receive from the surplus of people working under this increased technology the time to explore and invent and produce.

Major Markham, following the precepts of Horace Greeley, says, "Go west, young man," and, because the climate in our West Coast is salubrious throughout the year, he would have the entire population, not only of the United States but of the entire world, flock to our western shores. Now the ability to escape a diminishing return by migration, according to all the best authorities, is past. Lewis Mumford in his book, *The Condition of Man,* states that the era of migration is past and that the old theory of picking up stakes is obsolete because all of the world today is known and occupied. Increased technology, elimination of waste, and scientific increase of production must provide the substance of the inhabitants of the regions in which they now live. This care for what we have and our knowledge of how to recreate and reproduce conditions which are conducive to partial ease of living is our only salvation, and in the vast group of treatises on the subject of food and population and development there is no one else who has for one minute assumed that artificially changing the indoor climate will change the cycle of the ages in the slightest degree. Sooner or later our ease of living and our ease of production will over-populate the world in which we live, remembering always that the world has a very definite limit. If, in the past hundred and fifty years, our population has increased by four hundred million people and this rate of increase were to keep up, all of the air conditioning in the world would hardly save us from retrogression and renewed starvation.

In conclusion, it is this reviewer's opinion that Major Markham has touched on any number of interesting facts and data that can easily hold the attention of the readers through his two hundred pages, but, interested as I am personally in air conditioning and its future expansion and development, I can hardly credit to it the major importance that the author implies. —Walter L. Fleisher, New York, N. Y.

OPENS CONSULTING OFFICE

Victor J. Cucci, Room 282, 50 Church St., New York 7, N. Y., consulting and marine engineer, announces re-entering private consulting practice, specializing in design of residential, industrial, and commercial buildings, plumbing, heating, ventilating and air conditioning, marine heating, ventilating, and air conditioning surveys, testing, and balancing of ventilation for all types of ships.

Mr. Cucci was formerly chief engineer in charge of the ventilation department of George G. Sharp's office at 30 Church St., New York, for the past five years.

SUMMARY OF LOCAL CHAPTER MEETINGS

Chapter	Meeting Date	Subject	Speakers	Other Features	Attendance	Attendance Ratio*
Central Ohio	Oct. 16	What Next for Air Conditioning Engineers	Dr. B. M. Woods, University of California, Berkeley, Calif.	Charter Presented by S. H. Downs, Pres., ASHVE Officers Installed	59	
Cincinnati	Oct. 10	Work of C.E.D.	Millard Romaine, Asst. to Pres., Cincinnati Milling Machine Co.	Chairman Jennings reported on membership activities	20	0.33
Connecticut	Oct. 11	Effectiveness of the Nasal Passages in Conditioning the Air	L. E. Seeley, Yale University, New Haven	Joint meeting with ASME	34	1.2
Delta	Oct. 19	Lighting and Air Conditioning	James M. Todd and M. G. Zervigon	Discussion followed Joint meeting with New Orleans Chapter of IES	26	0.27
	Sept. 13	The Air Cooled Human Body	Dr. C.-E. A. Winslow, 1st Vice-Pres. of ASHVE, New Haven, Conn.	Joint meeting with Louisiana Engrg. Society.	220	0.64
Golden Gate	Oct. 11	Germicidal Lamps and Their Applications	Sam Hazleton, General Electric Co.	H. V. Hickman introduced as new Chairman of Membership Committee.	34	0.32
Illinois	Oct. 9	ASHVE Research and Its Laboratory	Cyril Tasker, Dir. of Research ASHVE, Cleveland, Ohio	Committee reports were submitted by Messrs. Kearney, Prentice, Philippi, Brooke, Ericsson and Mittendorff	67	0.43
Indiana	Oct. 27	Salvaging of the Normandie	A. C. W. Siecke, Merritt, Chapman and Scott Corp., New York, N. Y.	Tribute to Joe Hayes, only Life Member of Indiana Chapter	73	1
Massachusetts	Oct. 17	Radiant Heating	Charles A. Hawk, Jr., A. M. Byers Co., Pittsburgh, Pa.		68	1.03
Memphis	Oct. 18	Past, Present and Future of the Society	M. F. Blankin, Past Pres. of ASHVE, Philadelphia, Pa.	Charter Meeting—Charter presented by Pres. S. H. Downs, Kalamazoo	27	
		Value of Chapter Meetings and Benefits Derived Therefrom	Brig.-Gen. W. A. Danielson	W. A. Russell, Kansas City, Mo., discussed recent Denver Chapter organization meeting		
Michigan	Nov. 6	Heating and Air Conditioning in Latin American Countries	Alfred J. Offner, 2nd Vice-Pres., ASHVE, New York, N. Y.	"Wheels Across India," moving picture was shown	61	0.57
	Oct. 16	Packaged Heat	David Jones	"Brief for Invasion," U. S. Army official motion picture	61	0.57
Minnesota	Oct. 2	Radiant Heating	Charles A. Hawk, Jr., Pittsburgh, Pa.	Lyman Gross reported for Membership Committee	79	0.92
Montreal	Oct. 16	Panel Heating	P. B. Gordon, Wolff and Munier, New York, N. Y.	Film shown to illustrate talk	49	0.50

CHAPTER	MEETING DATE	SUBJECT	SPEAKERS	OTHER FEATURES	ATTENDANCE	ATTENDAN E RATIO*
Nebraska	Oct. 10	Heating and Air Conditioning in Latin American Countries	Alfred J. Offner, 2nd Vice-Pres., ASHVE, New York, N. Y.	Messrs. Ottum, Magarrell, Eaton, Kleinkauf and Williams were elected for Nominating Committee	15	0.60
	Sept. 19	Precision Naval Machinery for Victory (technicolor sound film) Joint meeting with American Military Engineers, Omaha Post		Two movies followed on "Operation of Tank-Bull Dozer" and "The Battle of Tarawa"		
New York	Oct. 16	Sub-Stratosphere Conditions of Temperature, Moisture and Pressures	Dwight Tenney, Pres., Tenney Engrg. Co., Montclair, N. J.	James Donnelly, charter member of N. Y. Chapter was introduced.	115	0.63
North Carolina	Sept. 8	The Air Cooled Human Body	Dr. C.-E. A. Winslow, 1st Vice-Pres., ASHVE	Nominating Committee elected as follows: Arvin Page, Harry Hoffman, K. W. Seldon, Jr., G. F. Altemueller, P. L. Guest Jr.	51	0.77
North Texas	Oct. 16	Industrial Direct Fired Heating	A. E. Whitney, Dravo Corp., Pittsburgh, Pa.	E. T. Gessell announced Nominating Committee as follows: M. L. Brown, Chairman, W. H. Moler and R. W. Allison	31	0.62
Northern Ohio	Oct. 9	Flow of Gas and Air in Various Systems	S. H. Downs, Pres., ASHVE, Kalamazoo, Mich.	R. J. Cummings reported for Legislation Committee	61	0.70
		The Use and Limitations of Pitot Tubes and Orifices	G. B. Priester, Vice-Pres. of Chapter, Cleveland	John James reported for Program Committee		
Pacific Northwest	Oct. 17	Cannons on Wings (sound film)		"Manufacture of Aluminum" (film) shown by Mr. McKay, San Francisco office of Reynolds Metals	32	0.48
Philadelphia	Oct. 12	New Developments in Air Conditioning for Multi-storied Buildings	N. E. Bueter, Products Specialist, Carrier Corp.	Nominating Committee appointed: J. H. Hucker, C. B. Eastman, W. F. Smith, W. P. Culbert, L. C. Davidson		
		Collective Bargaining, Kilgore Bill, and Philadelphia Building Code	Reported on by Edwin Elliot			
Rocky Mountain	Oct. 11	Charter Meeting-Heating and Air Conditioning in Latin America	Alfred J. Offner, 2nd Vice-Pres., ASHVE, New York, N. Y.	Mr. Offner presented Charter to J. H. McCabe Election of Officers: Pres. J. H. McCabe, Vice-Pres., G. D. Maves, Treas., W. M. Larimer, Sec'y, F. L. Adams, and Bd. of Governors, John Bernzen, J. J. Johnson, Dan McQuaid	53	1.1
St. Louis	Oct. 3	Mechanical Equipment of the Modern Department Store	Paul Sodemann, Bldg. Supt., Baier and Fuller Co.	C. F. Boester commented on current Research projects of Society	24	0.28

CHAPTER	MEETING DATE	SUBJECT	SPEAKERS	OTHER FEATURES	ATTENDANCE	ATTENDANCE RATIO*
Southern California	Oct. 11	Physiological Aspects of Stratosphere Flying	Dr. Lloyd W. Jedeka, Research Engr., Lockheed Aircraft Corp.	A Mayo Clinic film was shown on "Hyperventilation"	47	0.64
Washington, D. C.	Oct. 11	History and Growth of ASHVE Since 1915—Connection of Bureau of Mines with	A.C. Fieldner, Honorary Member of ASHVE and Chief of Fuels and Explosives Branch, Bureau of Mines	Comdr. T. H. Urdahl discussed the Society's Laboratory in Cleveland	50	0.43
Western Michigan	Nov. 6	Recent Developments in Heat Insulation	E. T. Cope, Research Dept., Detroit Edison Co.	Open Discussion	28	0.84
Western New York	Oct. 9	Air Movements	G. L. Tuve, Chairman of ASHVE Committee on Research, Cleveland, Ohio	S. W. Strouse reported on Council of all Engineering Societies in Buffalo		
Wisconsin	Oct. 16	The Actual vs. The Predicted Cooling Load on an Air Conditioning System	J. N. Livermore, Detroit Edison Co., Detroit, Mich.	Interesting Discussion followed	37	0.62

*The attendance ratios shown represent the meeting attendance divided by the Chapter membership. These will be useful as a partial indication of interest shown by local chapter members in various types of subjects programmed by other local chapters and may be helpful in deciding on subjects for other chapter meetings.

Candidates for Membership

The Constitution of the Society, as now amended, requires the following mode of procedure in voting on applicants for membership in the Society. All applications for membership are to be sent to the Secretary and the names of applicants and their references shall be printed in the next issue of the Journal of the Society or sent to the members in other approved manner as ordered by the Council. When replies are received from references, the Candidate's application shall be submitted to and acted upon by the Committee on Admission and Advancement as soon as possible.

When the Committee on Admission and Advancement has acted favorably upon a Candidate's application and assigned his grade, the Council shall vote upon the election of the proposed Candidate for membership by letter ballot. During the past month 79 applications for membership have been received and the names of these men and their sponsors are published in the following list.

Members are requested to scrutinize the list with care. The Committee on Admission and Advancement, and in turn, the Council, urge members to assume their share of responsibility of receiving these candidates into membership by advising the Secretary promptly of any whose eligibility for membership is in any way questioned.

All correspondence in regard to such matters is strictly confidential, and is solely for the good of the Society, which it is the duty of every member to promote.

Unless objection is made by some member by December 15, 1944, these candidates will be balloted upon by the Council. Those elected to membership will be notified by the Secretary immediately after election.

CANDIDATES	REFERENCES	
	Proposers	*Seconders*
Addie, George R., Managing Dir., J. G. Wagstaff, Ltd., Dukinfield, Cheshire, England.	Edgar Herring W. W. Nobbs	Walter Yates G. R. Jackson
Allen, Harold D., Mech. Engr., Cleveland Airport, Cleveland, Ohio.	D. L. Taze W. M. Rowe	J. E. Wilhelm R. H. Cutting
Appelt, Joseph E., Mgr., The Trane Co., Grand Rapids, Mich.	P. O. Wierenga O. D. Marshall	W. W. Bradfield C. A. Simonds
Arnold, Richard S., Asst. Chief Engr., Carrier Corp., Atlanta, Ga.	L. F. Lawrence, Jr. C. L. Templin	Leo Sudderth, Jr. C. B. Smoot
Ashley, Ronald D., Partner, United Equipment Co., Columbus, Ohio	H. R. Allonier J. D. Slemmons	T. R. Walker F. N. Schaad
Barton, Kenneth L., Indus. Engr., The Foxboro Co., New York, N. Y.	A. C. Buensod J. O. Ross	Milton Simkin R. B. Darling
Barton, Lawrence R., Asst. Chief Engr., Hayes Bros., Inc., Indianapolis, Ind.	F. C. Barton G. B. Supple	S. E. Fenstermaker W C. Bevington
Bell, Thomas H., Engr., Columbus Heating & Ventilating Co., Columbus, Ohio.	H. R. Allonier J. D. Slemmons	T. R. Walker F. N. Schaad
Bierl, Joseph G., Vice-Pres., Schollman Bros. Co., Omaha, Nebr.	E. F. Adams B. G. Peterson	D. E. McCulley H. Y. Kleinkauf
Brown, Robert M., Owner, Brown & Co., Atlanta, Ga.	L. C. Boland, Jr. B. J. Seckinger, Jr.	C. L. Templin L. L. Barnes
Caldwell, William J., Gen. Mgr., William J. Caldwell Co., Washington, D. C.	W. C. Jones J. W. Markert	J. H. Fogg R. E. von Otto

CANDIDATES	REFERENCES	
	Proposers	Seconders
CHASE, JIM C., Lt., U.S.N.R., Louisville, Ky.	J. C. Lewis William Miller	*J. W. Greely *David Clark
COLE, HAROLD S., Engr., Stone & Webster Engineering Corp., Boston, Mass.	E. L. Blair D. M. Archer	J. F. Tuttle P. H. Lair
COLTON, FREDERICK R., Branch Mgr., Norris Warming Co., Birmingham, England.	A. H. Barker F. J. Whyte	*J. H. Caramel *G. B. Raper
CROSS, LLOYD E., Gen. Supt., American Foundry & Furnace Co., Milwaukee, Wis.	R. A. Lingen H. W. Schreiber	J. R. Vernon J. A. Cutler
DAVIDSON, WILLIAM J., Application Engr., N. O. Nelson Co., Pueblo, Colo.	J. H. McCabe W. M. Larimer	J. J. Johnson Elmo Hall
DETWEILER, JOHN R., Dist. Repr., Minneapolis-Honeywell Regulator Co., Louisville, Ky.	C. F. A. Locke John Payton	F. C. Barton W. R. Shuttleworth
ELLIS, C. W., Engr., J. A. Walsh & Co., Houston, Tex.	J. A. Walsh F. C. Brandt	D. S. Cooper D. M. Mills
EMLEY, CHARLES G., Western Electric Co., Keyport, N. J.	*M. B. Perlman *L. E. Phillips	*V. P. Burke *C. F. Schrumpf
EWALD, JOHN H., Vice-Pres., James E. Degan Co., Detroit, Mich.	W. G. Boales W. H. Old	F. C. Purcell R. S. M. Wilde
FERRIS, ALLAN F., Mech. Engr., Ferris & Hamig, St. Louis, Mo.	L. L. Hamig J. W. Cooper	G. W. F. Myers R. H. Kremer
FRISSE, JOHN L., Owner, The Thermal Products Co., Cleveland, Ohio.	J. E. Wilhelm L. E. Slawson	Dennis Boggs W. R. Rhoton
GAY, CLARENCE E., SR., Mgr., Heaven Engineering Co., Kansas City, Mo.	L. P. Heaven R. B. Mason	D. M. Allen E. K. Campbell
GRANT, RALPH A., Engr., McCrea Equipment Co., Washington, D. C.	A. B. Devore J. C. Barnes	A. S. Gates, Jr. W. C. Jones
GREINER, MAURICE C., Field Engr., English & Lauer, Inc., Los Angeles, Calif.	J. F. Park W. F. Walker	A. J. Hess H. B. Lauer
GROSS, HERBERT A., Dist. Mgr., Surface Combustion, Minneapolis, Minn.	H. C. Mills H. M. Betts	Lyman Gross A. B. Algren
HINNANT, ROBERT H., Jr. Engr. and Draftsman, The National Advisory Committee for Aeronautics, Langley Field, Hampton, Va.	*W. L. Souther Ludwig Mack	*H. A. Pohlig *J. A. Neren
HORNER, FRANK S., Jr. Constr. & Maint. Engr., Burroughs Adding Machine Co., Detroit, Mich.	H. D. Chappell *B. S. Platt	*T. S. Bindshedler *C. E. Lyons
HULL, LOUIS M., Sales Mgr., Hammel Radiator Engineering Co., Los Angeles, Calif.	Leo Hungerford Art. Theobald	R. A. Lowe Maron Kennedy
JACKSON, ROBERT B., Partner, Lieb-Jackson Co., Columbus, Ohio.	J. D. Slemmons T. R. Walker	H. R. Allonier F. N. Schaad
JAMISON, ERNEST K., Field Proj. Mgr., The Huffman-Wolfe Co., Atlanta, Ga.	A. C. Gowdy W. J. McKinney	C. L. Templin L. L. Barnes
LEWIS, S. DAVID, Mgr., Westinghouse Electric Elevator Co., Cleveland, Ohio.	J. E. Wilhelm Dennis Boggs	R. A. Wilson H. M. Nobis
LITTLE, VERNON R., Chief Steam Engr., Curtiss-Wright Corp., Columbus, Ohio.	A. T. English J. D. Slemmons	H. R. Allonier T. R. Walker
LUMM, ALBERT H., JR., Chief Engr., A. H. Lumm Co., Toledo, Ohio.	R. H. Oberschulte R. D. Randall	T. H. Mabley A. V. Cauhorn
MAPLE, CHARLES W., Chief Draftsman, Avery Engineering Co., Cleveland, Ohio.	J. E. Wilhelm Dennis Boggs	W. R. Rhoton K. A. Gottschalk
MATTIMORE, JOHN D., Research & Devel. Dir., Tube Turns, Inc., Louisville, Ky.	John Hellstrom Howard Pound	H. C. Murphy James May
MCGOVERN, ARTHUR F., Dist. Mgr., Modine Manufacturing Co., Columbus, Ohio.	J. D. Slemmons H. R. Allonier	R. W. Pirrung H. E. Sproull
MCLENNAN, MILLARD C., Puget Sound Navy Yard, Bremerton, Wash.	I. A. Norman J. H. Marvin	R. D. Morse R. E. LeRiche
MCQUEEN, BOSTON, Engr., Hall-Neal Furnace Co., Indianapolis, Ind.	F. S. Boone G. A. Voorhees	L. W. Clark Frank Morrison
MORSE, ELWIN F., Field Engr., B. F. Sturtevant Co., Cleveland, Ohio.	Philip Cohen L. T. Avery	J. E. Wilhelm G. B. Priester
MULHOLLAND, DANIEL J., Supt., Consolidated Conditioning Corp., Dobbs Ferry, N. Y.	Thomas Baker C. S. Koehler	J. D. W. Robertson H. J. Rose
NEWTON, DAVID A., Chief Engr., Larkins Coils, Inc., Atlanta, Ga.	W. J. McKinney C. L. Templin	L. L. Barnes W. W. Carder
NUGENT, ARTHUR W., Special Repr., McQuay, Inc., Washington, D. C.	J. M. Osborne W. J. Killian	W. H. Littleford E. H. Lambert
OLLESHEIMER, LOUIS T., Factory Repr., Detroit, Mich.	W. H. Old R. L. Partlan	E. D. Sheley M. B. Shea
PETERSEN, RICHARD J., Research & Devel. Supvsr., Utility Fan Corp., Los Angeles, Calif.	Leo Hungerford Maron Kennedy	J. S. Earhart Art. Theobald
PHILIPS, EDWARD W., Dist. Mgr., Walworth Co., Cleveland, Ohio.	E. J. Sable W. A. Evans	L. G. Powers R. H. Cutting
PRIEBE, O. W., Assoc. Mech. Engr., U. S. Army Engineers, Textile Tower, Seattle, Wash.	Roy Conrad C. W. May	C. W. Finn R. E. LeRiche
QUIGLEY, MILES E., Engr., Harris Bros. Plumbing Co., Minneapolis, Minn.	L. C. Gross R. E. Gorgen	H. M. Betts L. K. Reisberg
RICHMOND, JOHN, Engr., The Sweeny & Wise Co., Cleveland, Ohio.	C. M. Humphreys J. A. Hall	H. M. Nobis J. E. Wilhelm
RODWELL, ROBERT D., Mech. Engr., Columbus Heating & Ventilating Co., Columbus, Ohio.	R. A. Wilson H. R. Allonier	J. D. Slemmons T. R. Walker
ROSS, SIDNEY S., Air Cond. Engr., Dwight D. Kimball, New York, N. Y.	Nathan Feder D. D. Kimball	*C. F. Blood *R. N. Baxter
ROTHROCK, R. K., Owner, New Orleans, La.	L. V. Cressy C. B. Gamble	W. H. Grant, Jr. W. P. Oster
SANFORD, HAROLD L., Owner, Sans Co., Jamestown, N. Y.	Herman Seelbach, Jr. J. F. Platz	S. W. Strouse W. H. Stell, Jr.
SCHUMACHER, JOHN F., Draftsman, Columbus Heating & Ventilating Co., Columbus, Ohio.	J. D. Slemmons T. R. Walker	H. R. Allonier F. N. Schaad
SEABRIGHT, FREDERICK C., Engr., Columbus Heating & Ventilating Co., Columbus, Ohio.	J. D. Slemmons H. R. Allonier	T. R. Walker F. N. Schaad

CANDIDATES	REFERENCES *Proposers*	 *Seconders*
SEYMOUR, C. D., Pres., Seymour Plumbing & Heating Contractors, Ltd., Toronto, Ont., Canada.	M. W. Shears J. J. Lawlor	Ernest Fox H. R. Roth
SINES, CHESTER F., Sr. Naval Archt., Puget Sound Navy Yard, Bremerton, Wash.	R. E. LeRiche L. L. Bysom	I. A. Naman J. H. Marvin
SMITH, RUSSELL H., Prop., Russell H. Smith Equipment Co., Columbus, Ohio.	R. B. Jackson T. R. Walker	T. H. Bell J. D. Slemmons
SPITZLEY, R. L., Inspector, General Petroleum Corp., Vernon, Calif.	R. L. Spitzley L. L. McConachie	A. E. Knibb W. H. Old
STEARNS, ELLIS J., Engr., National Bureau of Standards, Washington, D. C.	R. H. Feltwell R. S. Dill	C. H. Meyers W. E. Kingswell
STOBBE, GUSTAV C., Gen. Supt., Becker-Seidel-Clark Co., Cleveland Ohio.	D. L. Taze W. M. Rowe	R. T. Southmayd J. E. Wilhelm
STOFFER, GLEN H., Sales Engr., Carrier Corp., Detroit, Mich.	Harold Clark R. S. M. Wilde	R. H. Oberschulte M. B. Shea
STONER, WILLIAM C., Dist. Repr., Chrysler Airtemp, Atlanta, Ga.	W. W. Carder W. J. McKinney	J. J. Joyce J. M. Rittelmeyer
VENNEMAN, JUSTIN B., Project Engr., Utility Fan Corp., Los Angeles, Calif.	Leo Hungerford J. S. Earhart	Maron Kennedy Art. Theobald
VITALI, ORESTE J., Htg. Contr., United Engineering Co., North Bergen, N. J.	*J. A. Manalio P. G. Griess	P. D. Butler *C. H. Reinhardt, Jr.
WALTER, BURWELL J., Sales Engr., R. L. Deppmann Co., Detroit, Mich.	L. A. Burch T. H. Mabley	Marshall Bruce F. X. Marzolf
WAY, JAMES B., Mgr. of Equipment Dept,, Vipond, Tolhurst, Ltd., Montreal, Que., Canada.	R. A. Standring A. F. Lamontagne	A. M. Peart F. A. Hamlet
WEAVER, CHANDLER, Sales Engr., Surface Combustion, Denver, Colo.	F. L. Adams J. H. McCabe	W. M. Larimer G. D. Maves
WEST, JOSEPH H., Owner, West Bros. Sheet Metal, Atlanta, Ga.	W. J. McKinney C. L. Templin	L. L. Barnes W. W. Carder
WHELAN, LEO, Chief Engr., Ray Oil Burner Co., New York, N. Y.	E. R. Snavely *George Belsky	Theodore Kunzog *Eustace Soares
WHITTON, C. F., Sales Engr., Chatco Steel Products, Ltd., Toronto, Ont., Canada.	L. E. Fagan W. H. Evans	C. E. Goodman H. R. Roth
WILLIAMS, HENRY B., Asst. Chief Engr., McQuay, Inc., Minneapolis, Minn.	R. J. Resch E. H. Seelert	J. F. Stafford Lyman Gross
WISE, RAY A., The Sweeny & Wise Co., Cleveland, Ohio.	H. M. Nobis J. E. Wilhelm	W. A. Evans Dennis Boggs
WOLFE, CHARLES H., Mech. Engr., Columbus, Ohio.	J. D. Slemmons H. R. Allonier	T. R. Walker F. N. Schaad
WOLLERMAN, ARTHUR E., Sales Mgr., B. F. Sturtevant Co., Columbus, Ohio.	A. W. Williams T. R. Walker	J. D. Slemmons H. R. Allonier
YOVANOVICH, EMIL A., Expediter, Carnegie Illinois Steel Corp., Gary, Ind.	D. W. Swenehart *H. A. Pfoff	*F. L. Gray *T. R. Chambers
ZAHNER, LEO W., SR., Owner, A. Zahner & Co., Kansas City, Mo.	L. P. Heaven D. M. Allen	Carl Clegg J. B. Fehlig, Jr.
ZELLAK, JOSEPH, Engr., Sauer Co., Inc., Columbus, Ohio.	T. R. Walker F. N. Schaad	J. D. Slemmons H. R. Allonier
ZIEMBA, WALTER P., Draftsman, N. B. Hubbard, Detroit, Mich.	N. B. Hubbard M. B. Shea	W. G. Boales A. E. Knibb

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*Non-Member.

Candidates Elected

In the past issues of the Journal of the Society the names of the following men were listed as Candidates for Membership. The membership grade of each Candidate has been assigned by the Committee on Admission and Advancement and balloted upon by the Council. We are now instructed by the Council to post herewith, as required by Art. B-III, Sec. 8, of the By-Laws, the following list of candidates elected:

MEMBER

ALLEN, F. C., Mech. Engr., U.S. Bureau of Reclamation, Denver, Colo.

AMUNDSON, C. H., Sales Engr., Herman Nelson Corp., Moline, Ill.

ANGELL, L. D., Htg. & Vtg. Co-ordinator, Sperry Gyroscope Co. Inc., Brooklyn, N. Y.

BARNES, C. A., Engineer, E-G Sheet Metal Works, Atlanta, Ga.

BAXTER, A. G., Heating Engr., The Enterprise Foundry Company, Ltd., Nova Scotia, Canada.

BEARG, M. J., Engr., Ansco, Binghampton, N. Y.

BELINE, M. B., Engr., Washington Refrigeration Co., Washington, D. C.

BENSON, M. A., Branch Mgr., Johnson Service Co., Dallas, Tex. *(Reinstatement and Advancement)*

BERKLEY, C. D., Design Engr., U.S. Army Engineers, Seattle, Wash.

BERNHARD, GEORGE, Hewlett, N. Y. *(Reinstatement)*

BISHOP, A. H., Electrical Foreman, Abasand Oils, Ltd., Ft. McMurray, Alta., Canada.

BODWELL, G. B., Contract Mgr., The Philip Carey Mfg. Co., Cleveland, Ohio.

BRADBURY, G. L., Co-Partner & Mgr., Bradbury Bros. Htg. Co., Denver, Colo.

BRADY, G. A., Captain, U.S. Army, Ft. Douglas, Utah.

BRICKHAM, B. A., Consulting Engr., Denver, Colo.

BROWN, R. C., Mgr., Campbell Elsey & Co., Salt Lake City, Utah.

BULL, H. A., Sales Engr., Kruse Engineering Co., Newark, N. J.

CAMPBELL, E. K., JR., E. K. Campbell Heating Co., Kansas City, Mo. *(Reinstatement)*

CAMPION, CHARLES R., Partner, Wrightson & Campion, New York, N. Y.

CARSEY, E. A., Engineer, The Kirk & Blum Mfg. Co., Cincinnati, Ohio

COBURN, J. B. V., Combustion & Service Engineer, International Chimney Corp., Buffalo, N. Y.

CORRIGAN, J. A., Treas., Corrigan Co., St. Louis, Mo. *(Advancement)*

DAILEY, J. F., Typhoon Air Conditioning Co., Inc., New York, N. Y. *(Reinstatement)*

DAVENPORT, L. B., Chief Engineer, Air Conditioning Co. of So. Cal., Los Angeles, Calif.

DODD, J. A., Owner, John A. Dodd Co., Atlanta, Ga.

DROBA, C. B., Sales Engr., Ehret Magnesia Mfg. Co., Washington, D. C.

DUNBAR, L. W., Dist. Mgr., Clarage Fan Co., Cleveland, Ohio.

ENGLISH, A. T., Pres. & Gen'l Mgr., Columbus Air Conditioning Corp., Columbus, Ohio *(Advancement)*

GALABA, ALEXANDER, Chief Engineer, Morrison Products, Inc., Cleveland, Ohio

GRANDSTAFF, C. L., Engineer, The C. A. Olsen Mfg. Co., Elyria, Ohio

HELLAND, A. E., Engineering Officer, U.S. Navy, c/o Fleet Post Office, N. Y.

Hemeon, W. C. L., Ventilation Engr., Industrial Hygiene Foundation, Pittsburgh, Pa.

Henenfeld, H. K., Air Conditioning Engr., ASEA Electric, Ltd., Bombay, India.

Hill, A. M., Assoc. Prof. Heat Engineering, Tulane Univ., New Orleans, La.

Hubbard, Allen, Hubbard, Rickerd & Blakeley, New Haven, Conn. *(Reinstatement)*

Ince, F. E., Engineer, Giffels & Vallet, Inc., Detroit, Mich.

Joyce, Harry B., Erie, Pa. *(Reinstatement)*

Loveland, Francis P., Denver, Colo.

Lowe, R. A., Engineer, U. S. Engineer's Office, Los Angeles, Calif. *(Advancement)*

MacDonald, James, District Mgr., Reid Hayden, Inc., Charlotte, N. C.

McLane, E. H., Supervisor, York Corp., Houston, Texas.

Miller, David C., Buerkel & Co., Inc., Boston, Mass. *(Reinstatement)*

Monahan, M. B., Mfrs. Agent, M. B. Monahan, Montreal, Que., Canada.

Montesano, F. P., Mgr., The Frank A. McBride Co., Paterson, N. J. *(Advancement)*

Moore, R. S., Precipitron Engineer, Westinghouse Elec. & Mfg. Co., Chicago, Ill.

Murray, G. F. J., Technical Mgr., British Doby Stokers, Ltd., London, Eng.

Naylor, J. F., Jr., Branch Mgr., The Trane Co., St. Louis, Mo.

Pangborn, C. A., Mech. Engineer, N.A.C.C., U.S. Navy, Seattle, Wash.

Pasek, L. E., Development Engineer, Kimberly-Clark Corp., Washington, D. C.

Patterson, J. C., Jr., Marine Engineer, La Del Conveyor & Mfg. Co., Washington, D. C.

Pirrung, R. W., Htg. & Vtg. Engineer, The Huffman-Wolfe Co., Columbus, Ohio

Ramsey, E. C., Heating Engineer, The Ohio Fuel Gas Co., Columbus, Ohio

Reed, George G., Htg. & Vtg. Engineer, N.A.C.A., Cleveland, Ohio

Sayler, W. H., Partner-Engr., Specialty Sales Co., Salt Lake City, Utah.

Schaad, Fred N., District Repr., Warren Webster & Co., Columbus, Ohio

Scott, R. P., Commercial Sales Mgr., Bard, Inc., Columbus, Ohio

Sedgwick, S. W., District Mgr., Trane Co. of Canada, Ltd., Toronto, Ont., Canada

Simmons, Noah M., Piping and Htg. Contractor, Noah M. Simmons Co., Indianapolis, Ind.

Slater, W. F., President, W. F. Slater Engineering Corp., Memphis, Tenn.

Smith, G. E., Design, Ministry of Works, London, England. *(Advancement)*

Terrance, E. H., Manager, Canadian Sirocco Co., Montreal, Que.

Thacker, John E., Engineer, Vauxhall Motors, Ltd., Luton, Beds., England.

Thom, Herbert C. S., Chief, Statistics Division, U.S. Weather Bureau, Washington, D. C.

Turner, G. W., Sales-Engineer, Minneapolis-Honeywell Reg. Co., Cedar Rapids, Iowa

Vincent, H. B., Mgr., Owens-Illinois Glass Co., Toledo, Ohio

Wilde, D. R., Engineer, William & Richardson, Salt Lake City, Utah

Winterbottom, J. W., Winterbottom Supply Co., Waterloo, Iowa. *(Reinstatement)*

Wolfe, A. H., Vice-Pres., The Huffman-Wolfe Co., Columbus, Ohio

ASSOCIATES

Akerlow, R. W., Engineer, Stearns-Roger Mfg. Co., Denver, Col.

Angelo, Herbert G., Heating Engineer, Stearns-Roger Mfg. Co., Denver, Col.

Beery, Vernon L., Mech. Engr., Smoky Hill Army Airfield, Salina, Kans.

Berry, Patrick M., Secy. and Treas., Standard Asbestos Mfg. Co., Cleveland, O.

Bloch, Leonard L., Owner, Leonard L. Bloch, New York, N. Y.

Boehler, Carl L., Sales Manager, J. A. Walsh & Co., Inc., Houston, Texas.

Bowers, Charles L., Manager, E. G. Sheet Metal Works, Hapeville, Ga.

Brackmann, Walter H., Fuel Engineer, Kansas City Coal Service Institute, Kansas City, Mo.

Burns, Robert O., Engineer, Dallas Air Cond. Co., Dallas, Texas

Burrows, Austin J., Field Engineer, U.S. Engineers, Northampton, Mass.

Callan, William D., Dept. Mgr., The Philip Carey Mfg. Co., Lockland, Ohio

Callaway, James H., Mech. Engr., Bell Aircraft Corp., Marietta, Ga.

Calongne, Henry J., Jr., Mech. Engr., Emile M. Babst Co., New Orleans, La.

Carleton, H. G., Assoc. Mech. Engr., Maritime Commission, Washington, D. C.

Case, Donald P., Engineer-Estimator, W. C. Wiedenmann & Son, Kansas City, Mo.

Conroy, W. T., Owner, W. T. Conroy, Contractor Plbg. & Htg., Kansas City, Mo.

Dapper, M. J., Owner, M. J. Dapper Co., Tacoma, Wash.

Davis, W. M., Field Engineer, Conco Engineering Works, Muncie, Ind.

Dyer, Alvin R., Manager, Htg. & Air Conditioning Dept., Utah Builders Supply Co., Salt Lake City, Utah

Engelbach, A. A., Gen'l Mech. Engr., National Capital Housing Authority, Washington, D. C.

Ferrara, Anthony L., Partner, Standard Heating Co., Minneapolis, Minn.

Foit, William R., Engineer, Curtiss-Wright Corp., Airplane Division, Robertson, Mo.

Fyfe, John H., Chief Engineer, Automatic Coal Burner Co., Philadelphia, Pa.

Gorsuch, W. J., Associate Naval Arch., Norfolk Navy Yard, Portsmouth, Va.

Gregory, Paul E., Sales Engineer, Horne-Wilson, Inc., Atlanta, Ga.

Gross, Victor L., Sales Engineer, Taylor Forge & Pipe Works, New York, N. Y.

Haas, Emil, Jr., Natkin & Co., Kansas City, Mo. *(Reinstatement)*

Hartmann, Charles W., Sales Engineer, A. F. Hinrichsen, Inc., New York, N. Y.

Hillen, W. G., Carrier Corp., Syracuse, N. Y. *(Reinstatement)*

Hook, Louis M., Sales Engineer, Rio Grande Fuel Co., Denver, Colo.

Johnson, Harry H., Owner, City Plbg. & Htg. Co., Laramie, Wyo.

Jones, T. Paul, Owner, Air Equipment Co., Denver, Colo.

Kenney, Daniel J., Chief, Fuels and Utilities Unit, Boston Ordnance Dist., Boston, Mass.

Landers, David N., Owner, Landers Plbg. & Htg. Co., Atlanta, Ga.

Lees, John, Engineer, Board of Education, Detroit, Mich.

Levy, Robert, Senior Mech. Engr., Federal Public Housing Authority, Washington, D. C.

Lix-Klett, Luis, Chief Engineer, Carrier Lix-Klett, Buenos Aires, Republic Argentina, S. A.

Long, Eugene L., District Representative, The Avery Engineering Co., Columbus, O.

Manna, Anthony F., Designer, Wilbur Watson & Associates, Cleveland, O.

Martin, W. A., Mgr., Air Conditioning Dept., American Heating Co., Washington, D. C.

Mathaney, Edgar H., Snapper Sheet Metal Worker, U.S. Coast Guard Yard, Curtis Bay, Md.

Matthews, C. R., Service Mgr., Minneapolis-Honeywell Reg. Co., Lakewood, O.

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Miller, Henry D., Mgr., Air Conditioning Dept., General Electric Supply Corp., Salt Lake City, Utah

Nelson, Walter L., Chief Mech. Engr., District Govt., District Bldg., Washington, D. C.

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Novak, Charles J., District Fuel Rationing Officer, O.P.A., Indianapolis, Ind.

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Osberger, T. L., T. L. Osberger Co., Grand Rapids, Mich. *(Reinstatement)*

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Smith, O. F., Jr., Project Engineer, Armstrong Cork Co., Lancaster, Pa.

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Northern Ohio	L. S. Ries	John James
Oklahoma	E. T. P. Ellingson	
Ontario	V. J. Jenkinson	W. C. Kelly
Oregon	E. C. Willey	
Pacific Northwest	M. N. Musgrave	J. D. Sparks
Philadelphia	H. B. Hedges	Edwin Elliot
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Southern California	Leo Hungerford	W. O. Stewart
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Wisconsin	A. S. Krenz	M. W. Bishop

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Central Ohio: Organized, 1944. Headquarters, Columbus, Ohio. President, J. D. Slemmons, 2 Fifteenth Ave., Columbus 1. Secretary, A. W. Williams, 5 E. Long St., Room 808, Columbus 15.

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Delta: Organized, 1939. Headquarters, New Orleans, La. Meets, Second Tuesday. President, L. V. Cressy, 423 Baronne St., New Orleans 13. Secretary, J. S. Burke, 317 Baronne St., New Orleans 9.

Golden Gate: Organized, 1937. Headquarters, San Francisco, Calif. Meets, First Wednesday. President, C. L. Peterson, 2 Indian Rock Path, Berkeley. Secretary, James Gayner, 260 California St., San Francisco 11.

Illinois: Organized, 1906. Headquarters, Chicago, Ill. Meets, Second Monday. President, A. O. May, Room 925, 53 W. Jackson Blvd., Chicago 4. Secretary, C. M. Burnam, Jr., Room 1605, 6 N. Michigan Ave., Chicago 2.

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Manitoba: Organized, 1935. Headquarters, Winnipeg, Man. Meets, Third Thursday. President, Einar Anderson, 152 Bannerman Ave. Secretary, F. T. Ball, 810 9th Ave., W., Calgary, Alta.

Massachusetts: Organized, 1912. Headquarters, Boston, Mass. Meets, Third Tuesday. President, D. M. Archer, 143 Federal St., Boston 10. Secretary, C. W. Larson, 184 Sycamore St., Roslindale.

Memphis: Organized, 1944. Headquarters, Memphis, Tenn. President, J. J. Nolan, 78 Washington Ave. Secretary, W. E. Thorpe, 78 Washington Ave.

Michigan: Organized, 1916. Headquarters, Detroit, Mich. Meets, First Monday after 10th of month. President, W. H. Old, 1761 Forest Ave. W., Detroit 8. Secretary, A. E. Knibb, 1003 Maryland Ave., Detroit 30.

Minnesota: Organized, 1918. Headquarters, Minneapolis, Minn. Meets, First Monday. President, F. W. Legler, 17 W. 28th St. Secretary, F. H. Schernbeck, 1057 10th Ave. S. E.

Montreal: Organized, 1936. Headquarters, Montreal, Que. Meets Third Monday. President, A. M. Peart, 637 Craig, W. Secretary, Leo Garneau, Room 832, Dominion Square Bldg.

Nebraska: Organized, 1940. Headquarters, Omaha. Meets, Second Tuesday. President, B. G. Peterson, 6235 Florence Blvd. Secretary, D. E. McCulley, 814 S. 14th St., Omaha 2.

New York: Organized, 1911. Headquarters, New York, N. Y. Meets, Third Monday. President, C. S. Koehler, 4374 Richardson Ave., New York 66. Secretary, Carl H. Flink, Room 3000, 51 Madison Ave., New York 10.

North Carolina: Organized, 1939. Headquarters, Durham, N. C. Meets, Quarterly. President, F. E. P. Klages, 1034 Jefferson Standard Bldg., Greensboro. Secretary, W. L. Hunken, 707 Guilford Bldg., Greensboro.

North Texas: Organized, 1938. Headquarters, Dallas, Tex. Meets, Third Monday. President, L. C. McClanahan, 603 Great National Life Bldg. Secretary, E. J. Stern, 701 Burt Bldg., Dallas 1.

Northern Ohio: Organized, 1916. Headquarters, Cleveland, O Meets, Second Monday. President, D. L. Taze, 1302 Swetland Bldg., Cleveland 15. Secretary, R. H. Cutting, 3795 Glenwood Rd., Cleveland Heights.

Oklahoma: Organized, 1935. Headquarters, Oklahoma City, Okla. Meets, Second Monday. President, E. T. P. Ellingson, 314 Savings Bldg., Oklahoma City 2. Secretary, G. T. Donceel, Oklahoma Natural Gas Co.

Ontario: Organized, 1922. Headquarters, Toronto, Ont. Meets, First Monday. President, A. S. Morgan, 156 Glenmanor Dr. Secretary, H. R. Roth, 57 Bloor St., W.

Oregon: Organized, 1939. Headquarters, Portland, Ore. Meets, Thursday after First Tuesday. President, E. C. Willey, Oregon State College, Corvallis. Secretary, G. H. Risley, 516 S. W. Oak St., Portland 4.

Pacific Northwest: Organized, 1928. Headquarters, Seattle, Wash. Meets, Second Tuesday. President, M. N. Musgrave, 2019 Third Ave., Seattle 1. Secretary, J. D. Sparks, 7331 W. Green Lake Way, Seattle 3.

Philadelphia: Organized, 1916. Headquarters, Philadelphia, Pa. Meets, Second Thursday. President, A. C. Caldwell, 550 So. 48th St., Philadelphia 43. Secretary, J. O. Kirkbride, Fourth and Locust Sts., Philadelphia 6.

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Rocky Mountain: Organized, 1944. Headquarters, Denver, Colo. Meets, First Wednesday. President, J. H. McCabe, 1730 Glenarm St. Secretary, F. L. Adams, P. O. Box 840, Denver 1.

St. Louis: Organized, 1918. Headquarters, St. Louis, Mo. Meets, First Tuesday. President, G. B. Rodenheiser, 4431 Finney Ave., St. Louis 13. Secretary, B. L. Evans, 571 Stratford Ave., University City.

South Texas: Organized, 1938. Headquarters, Houston, Texas. Meets, Third Friday. President, A. F. Barnes, 602 Kirby Bldg., Houston 2. Secretary, B. P. Fisher, Box 92, Houston 1.

Southern California: Organized, 1930. Headquarters, Los Angeles, Calif. Meets, Second Wednesday. President, Leo Hungerford, 3485 Wonderview Pl., Los Angeles 28. Secretary, Arthur Theobald, 336 North Foothill Rd., Beverly Hills, Calif.

Utah: Organized, 1944. Headquarters, Salt Lake City, Utah. President, H. G. Richardson, 1433 Harvard Ave. Secretary, E. V. Gritton, 2470 So. 15th East St.

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Western Michigan: Organized, 1931. Headquarters, Grand Rapids, Mich. Meets, Second Monday. President, H. D. Bratt, 2259 Stafford Ave., S. W., Grand Rapids 7. Secretary, Frank Harbin, Jr., 181 West 21st St., Holland.

Western New York: Organized, 1919. Headquarters, Buffalo, N. Y. Meets, Second Monday. President, S. W. Strouse, 493 Franklin St., Buffalo 2. Secretary, G. E. Adema, 39 W. Balcom St.

Wisconsin: Organized, 1922. Headquarters, Milwaukee, Wis. Meets, Third Monday. President, I. J. Haus, 3880 N. Richards St., Milwaukee 1. Secretary, M. W. Bishop, 231 W. Wisconsin Ave., Milwaukee 3.

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*Member of Committee on Research.

0TH DIRECTORY SECTION APPEARS THIS MONTH

Starting in January 1935, Heating, Piping & Air Conditioning has published in its first issue each year a complete Directory Section of Heating, Piping & Air Conditioning Equipment for Industry and Large Buildings. The Directory Section for 1944 appears this month; the first such classification to be compiled in its field, this listing is the most complete, the most carefully prepared, the most logically arranged and cross-indexed, and consequently the most useful. At least, that's the way we feel; so do many of our readers, and we hope you will, too, as you refer to it throughout the year.

Like Gaul, the Directory Section is divided into three parts. In the first, the products are classified, all manufacturers being listed under the numerous classifications. The second part lists, alphabetically, all trade names which are not the same as or easily identifiable from the manufacturer's name. Part three gives the complete street addresses for all manufacturers whose names appear in the Directory Section. The names of those manufacturers advertising in *this issue* of HPAC are spotted throughout the Directory Section, as a service to users of the listings.

In addition to the Directory Section, the regular quota of articles and other editorial material—and the Journal Section of the American Society of Heating and Ventilating Engineers — are published this month, as every month.

URGES CONGRESS TO ACT ON POSTWAR CONSTRUCTION

Eric A. Johnston, president of the United States Chamber of Commerce, in testimony given before the House committee on public buildings and grounds last month, advocated early action by Congress on a policy respecting the position of the construction industry and public works in the postwar program.

Mr. Johnston favored adoption of a policy making clear to the country the following principles:

"1) That Congress looks to the construction industry to eliminate its own peaks and valleys so far as possible and in that way to make its own contribution to providing useful employment, and does not expect that industry to stabilize our whole economy.

"2) That Congress expects the city, county, and state governments to finance their own ordinary local public works, such as water systems, street improvements, educational buildings, and recreational facilities.

THE EDITOR'S PAGES

"3) That the federal government will correlate its own proper public works expenditures through a suitable agency, in order that there may be certainty in regard to what the federal government is going to do, and elimination of wasteful expenditures.

"4) That the federal government's public works will be undertaken through the contract method of public construction.

"5) That the federal government will not undertake any activities in the field of housing which will compete with private builders or interfere with the community's responsibility for the enforcement of minimum housing standards and the relief of needy families."

Mr. Johnston said that to make such a public policy on construction realistic Congress should make suitable changes in tax laws with a view to the encouragement of private investment and reconversion to peacetime operations. Revision of the tax structure, he said, also should be designed to make available additional sources of revenue for state and local governmental use, thus helping to free the states and municipalities from dependence upon the federal government.

1943 INDEX CONSERVES PAPER

Numerous requests from subscribers to HPAC for copies of the complete editorial index for the year 1943 have been received and will be complied with as soon as the printed copies are available. If you want one, drop a line to The Editor, Heating, Piping & Air Conditioning, 6 N. Michigan Ave., Chicago 2, Ill. The index is being published as a separate pamphlet this year, instead of incorporating it in the December issue as usual, in order to conserve paper, a vital war material.

All publishers must take careful steps to conserve paper usage for magazines, books, and newspapers —and to employ each pound of paper used to the best advantage. In addition to the measures which can be used to conserve the large tonnages of paper used for publication purposes, there are many other savings which, while individually small, are nevertheless worthwhile and which can be adopted in any organization. We're using postcards, for example, for a lot of our correspondence and no one has objected yet. When file carbons of letters are necessary, they can be on the back of the letter being answered (which saves filing space and time, too). Most of the proof sheets we send to authors go out now without an accompanying letter, a rubber stamp being used to convey our request for careful proofreading and checking.

REVEALS TREND OF POSTWAR APARTMENT HEATING

Trends of postwar apartment design and construction were revealed last month when the Minneapolis-Honeywell Regulator Co. announced the winners of its $10,000 heating design contest. Based on plans for a six story apartment building, prizes were awarded to 26 architects and heating engineers for designs of a system of steam heating and its control, and a system of hot water heating and its control.

First prize for the system of steam heating was awarded to Clyde H. Baker, architect of Detroit, and first prize for the hot water heating system was won by Leonard Weger, Philadelphia architect. First prizes were $2000 each.

Second prizes of $1000 went to Paul E. Nystrom, Madison, Wis., for steam and to Walter T. Rolfe, Austin, Texas, for hot water. Third prizes of $500 were won by Abraham Walton, Jersey City, for steam, and John A. MacWilliam and Abraham D. Rubin, Perth Amboy, N. J., for hot water heating. In addition there were 20 honorable mention awards of $150 equally divided between steam and hot water heating systems.

"All contest entrants provided for personalized heat control," John E. Haines, manager of the company's space heating controls division, said, "so that every occupant of postwar apartments will be able to determine and control the exact temperature he desires in his own living space."

More than 2000 architects and heating engineers entered the contest, according to Mr. Haines, and of these 513 submitted plans in the competition. Entries were received from nearly every state in the union and the prize winners were located in all parts of the country, indicating, he said, that interest in postwar apartment building is not confined to large eastern and far west cities, but is nationwide.

Analysis of systems submitted in the competition indicates a very definite trend away from one pipe steam systems, he stated.

Postwar apartment dwellers will not have to open windows to cool off, nor cajole the janitor for more heat, he said, because each individual tenant will be able, if such personalized heating systems are adopted, to control the amount of heat going to his apartment by the thermostat mounted in his own living space. This thermostat will operate controls leading off from the central heating system and automatically hold apartment temperatures at the point selected. Personalized heating represents the latest advance in apartment design, he continued, and after the war will be as common as the electric refrigerator.

An independent research corporation, at the instigation of Minneapolis-Honeywell, recently surveyed approximately 1000 apartment dwellers in typical U. S. cities, Mr. Haines said. The survey disclosed that 84 per cent of the people living in apartments believe that it is either necessary or desirable to have their own control over the amount of heat being supplied to their personal living space. Because of this, he stated, personalized apartment heating will be of considerable advantage to apartment house owners because apartments will be more easily rented and the added tenant satisfaction will result in longer leases. "The survey showed that 48 per cent of the people interviewed were willing to pay an average of $5.00 a month additional rent for individual apartment heating control. In addition, tests run by the National District Heating Association showed that automatic control systems of this type provided an average fuel saving of 18 per cent," said Mr. Haines.

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All entries in the contest were judged anonymously by a jury of three consisting of Edward E. Ashley, consulting engineer of New York, John W. Root, Holabird and Root, Chicago architects, and Mr. Haines.

MASTER STEAM FITTERS CHANGE ASSOCIATION NAME

It was announced early last month by Louis T. Braun, executive secretary, that the corporate name of the Chicago Master Steam Fitters' Association has been changed to the Heating, Piping & Air Conditioning Contractors' Chicago Association. The street address is 228 N. La Salle St., Chicago 1.

POSTWAR AIR CONDITIONING LOOKS PROMISING

"Right now," says R. W. Kritzer, president of Peerless of America, "we are up against the hard, blunt facts of war and the grim necessity of winning it. All our energies are now being devoted to this end.

"At the same time, we are thinking and planning for the day when the last shot is fired. Fortunately for us, the postwar picture looks promising. Scientific air conditioning, refrigeration, and heating—despite the great advances made in recent years—was just coming into its own when halted by the war. Fortunately for us, too, when peace comes we will have the capacity to take care not only of the business we normally enjoyed, but of this brand new business that is bound to come."

FIGHT INFANTILE PARALYSIS!

The high cost of epidemics is well illustrated by the 1943 outbreak of infantile paralysis which was the worst in 12 years, the National Foundation for Infantile Paralysis points out. Almost 12,000 persons—men, women and children—were stricken with this disease last year. Only twice before in the recorded history of infantile paralysis have there been more cases reported.

The total cost of the 1943 epidemic cannot be estimated because many of those stricken will still be patients in 1944 and some of them for many years thereafter, the foundation points out in making its annual appeal for funds, January 14 to 31, through the "March of Dimes."

STICKNEY HEADS REFRIGERATING ENGINEERS

A. B. Stickney, engineer with Armour & Co., was elected president of the American Society of Refrigerating Engineers at the annual meeting of the organization held in Philadelphia last month. Charles S. Leopold, consulting engineer specializing in air conditioning, and a member of HPAC's board of consulting and contributing editors, was elected a vice-president, as was John F. Stone, manager of the refrigeration division of Johns-Manville. John G. Bergdoll, chief engineer of York Corp., was named treasurer.

POSTWAR PLAN CONTEST HELD FOR EMPLOYEES

In order to gather all of the ideas of each employee to assist management in planning for the future, the Lincoln Electric Co. is conducting a postwar planning competition for its employees. Ending July 1, winners are to be announced in August.

Suggested subjects for entries include postwar products which the company is in position to build and are along the line of its present endeavor, and methods of manufacturing suggested postwar products or present products.

EASY POSTWAR TRANSITION FOR CONSTRUCTION

The construction industry of the United States will be able to swing into the transition from wartime to peacetime economy without difficult conversion problems, and will be able to provide a volume of activity in the years of the first postwar decade even greater than that experienced during the boom that followed the first World War. This declaration is made by F. W. Dodge Corp. in an extensive analysis of Construction Potentials; Postwar Prospects and Problems, prepared by the company's committee on postwar construction markets, under the chairmanship of Thomas S. Holden.

"There is no conversion problem for the construction industry as such," the report declares. "Quick adaptation of techniques and facilities to new types of projects is part of the regular stock in trade of the industry. Architects, engineers, and contractors engaged on the war construction program were able to expand their organizations overnight and to carry out the largest construction program in the history of this or any other country with the utmost speed, overcoming unusual difficulties and in a vast number of cases completing projects ahead of schedules."

F. W. Dodge Corp. has estimated that total construction volume in the 10 years following the war will average approximately double the average annual volume of the 1930-39 decade (the decade of depression and slow recovery). This would be an increase of about 5 per cent over the prosperous 1920-1929 decade. The estimate expresses postwar volumes in terms of prewar cost levels.

Within this increase, residential building volume is expected to average *three times* the average residential building volume of the 1930-39 period; non-residential building would increase about 70 per cent over its 1930-1939 average; heavy engineering construction would increase about 50 per cent.

The rate at which the industry will swing into its full peacetime volume will be conditioned by several important factors, principal among which are time schedules for release of critical raw materials to building product manufacturers; the reconversion problems of some building product manufacturers; manpower problems; release of price, wage, and rent controls; and the disposal by the government of surplus property.

NAMES IN THE NEWS

Staynew Filter Corp. recently changed its name—but not its management or general policies — to Dollinger Corp., after its president and founder, Lewis L. Dollinger. Expanded facilities, and new products to be announced, made the name change advisable. . . . Richard S. Dawson is now vice-president in charge of sales of Alco Valve Co.; he has been general sales manager for the last four years. . . . John G. Bergdoll, of Yorl Corp., recently received an award sponsored by Wolverine Tube Co. for "the year's outstanding technical paper on refrigeration" published in the ASRE's journal, Refrigerating Engineering. He wrote on engineering studies of problems involved in creating high altitude weather in a new stratosphere test chamber. . . . C. T. Morse was elected president of the National Association of Fan Manufacturers last month; J. M. Frank is vice-president and L. O. Monroe is secretary-treasurer. . . . Leo J. Freitas returned last month to his duties as field engineer for Alco Valve Co., after a leave of absence since July '42 with the WPB, where he served in the refrigeration section, assisted in the administration of the L-38 and M-28 orders, and was chief of the refrigerant and accessories unit. . . . The Marley Co., Inc., has established a divisional office at Houston to provide immediate and direct coverage of the Texas Gulf coast, northwestern Louisiana, and southwestern Arkansas. Ray T. Jenkins heads the new division. . . . Bruce A. Fleming has been elected vice-president in charge of sales at Edwin L. Wiegand Co., succeeding Ernest N. Calhoun who recently became president of the company. . . . Potter Bowles, president of the Hoffman Specialty Co., has announced the appointment of John H. Seippel as vice-president and general manager. . . . Employees of the B. F. Goodrich Co. turned in 7790 suggestions in the effort to speed up war production during 1943, 64 per cent more than in the preceding year; 2621 of the ideas were put to use.

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CENTRIFUGAL COMPRESSORS AID PROJECTILE DESIGN

A new and interesting application of centrifugal compressors has been developed for the ballistic research laboratory at the Aberdeen proving ground, where the huge machines will play a vital part in supersonic wind tunnels, according to Carrier Corp.

Heretofore the design of projectiles has been based largely on the results of actual firing on the range. The wind tunnel is a new instrument that will give much information on the effect of the air on the flight of projectiles. It will be of great value in the design of projectiles that have minimum resistance and hence maximum striking velocity. It will help to determine the laws that govern the flight of projectiles moving at velocities greater than the speed of sound.

In the new laboratory, air will be circulated in tunnels at high pressures, and released through nozzles to stream over the projectiles being tested. Five compressors will supply the air to the tunnels, from which it will flow over stationary projectiles, held in a fixed position by streamlined supports. The supports will be mounted on a balance system constructed to measure and record any forces that are imposed on it. As the air blows past at high velocity, it exerts a violent pressure over the projectile's surface, and the reaction transmitted by the support is measured and recorded by the balance system. From these data it will be possible to design projectiles with minimum resistance. The results will be projectiles with greater velocity when striking the target, greater fire power, and greater accuracy.

The compressors which furnish the various volumes and pressures needed for circulating air in different tests can be connected so that they will operate in series, in parallel, or in a combination of circuits to produce a wide range of pressures and volumes. The entire circuit of the air is closed so tightly that very little leakage occurs. Before it enters the circuit the air is dehydrated to the point where only 0.005 grain per lb of air remains.

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WHY BUILDING INDUSTRY HAS BRIGHT FUTURE

Five reasons why the building industry should be in an exceptional position to render prompt and far-reaching service to the country by providing employment and stimulating business generally during the period of economic readjustment after the war were advanced in a year end statement by Herbert Abraham, president of the Ruberoid Co.

"First," Mr. Abraham said, "the building industry will require thousands of men to construct peacetime living quarters for the demobilized men, including the many new families among them, and for workers returning from war industry centers to their normal peacetime localities. In addition, the government, as a means of reducing unemployment after demobilization, will probably find it necessary to launch a sizable program of slum clearance, road building, and river and harbor improvements.

"Second, the industry's potential postwar market in the field of residential construction alone will be of unprecedented proportions, recent estimates indicating an urgent need for 1,000,000 or more new dwelling units annually for several years.

"Third, a substantial volume of new farm construction will be necessary, since the United States will undoubtedly be called upon for some time to supply food for the people of war devastated regions abroad as well as our own.

"Fourth, building activity as a whole will be stimulated by the introduction of improved building products developed in the course of wartime research.

"Fifth, ample supplies of all essential building materials can be made quickly available because the great bulk of such materials produced for wartime purposes have been of the same general character as those ordinarily used."

* * *

Control of the air in industry—by means of air conditioning—is helping to win the battle of production, just as control of the air on the fighting fronts helps to win military victories.

CLIMATE GROUP PLANS FOR BETTER BUILDINGS

"One of the most hopeful signs for a better world, after victory, is the awakened public interest in human comfort and health. For along with the fight for freedom, humanity is waging a winning battle against suffering from extremes in heat and cold, as well as disease," declared Paul B. Zimmerman, president of the Indoor Climate Institute, at a meeting of the ICI board of directors. "Throughout America, manufacturers of prime heating, cooling, and air conditioning equipment are carrying on intensive research, assisted by many scientific bodies and institutions of learning, on the subject of controlling temperature and humidity. Their findings are being applied continuously to both the production and battle fronts."

C. T. Burg, general sales manager of Iron Fireman Mfg. Co. and chairman of the ICI public relations committee, said that an anticipated project of the institute is the publication of a manual or primer for the building trade. This manual would be available to speculative builders, architects, schools and associations, and members of the building trade, who will find, within its covers, "an unprejudiced but complete analysis of the various types of equipment essential to the proper regulation of indoor climate." Presentation of both educational and technical data would be graphic and designed to be of particular value to the thousands of men who, after the war, will turn to the building industry for a living. They will not have had an opportunity to keep abreast of the rapid developments in the heating, cooling, and air conditioning industries that have taken place during the war. With the building industry as the expected No. 1 industry of the nation in the postwar period, it is desirable to shorten the time element necessary for the "education" of approximately 75,000 speculative builders to whom the nation must turn for postwar housing. The proposed manual will, as evidenced in the institute's published policies, incorporate only those standards which have been sponsored or approved by the respective branches of the recognized related industries, through their associations and technical groups.

NASH-KELVINATOR PREPARES FOR POSTWAR PERIOD

Nash-Kelvinator Corp. has prepared for the postwar period in all respects except signing of orders to toolmakers and suppliers, according to George W. Mason, president, last month. "When peace comes the responsibility of all industry will be to convert as quickly and painlessly as possible," he said. "I think that the unemployment period will be short and not as severe as many think. I believe industry as a whole is aware of its responsibility. We have gone over all our plants thoroughly to reconvert and production schedules for the postwar period have been set. The layouts are complete. We know where every piece of machinery goes. Every major vendor has been contacted so he knows his part."

YORK SHARES ON N. Y. EXCHANGE

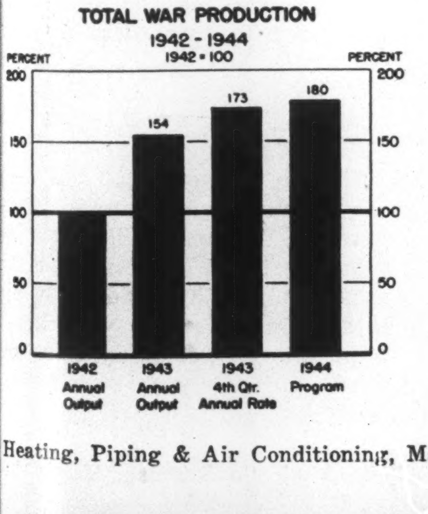
Shares of the York Corp., one of the nation's largest producers of refrigeration and air conditioning equipment, have been admitted to trading on the New York stock exchange. The company had 928,626 common shares outstanding at the opening of the first day of trading. . . . More than 85 per cent of York's total production volume is devoted to turning out refrigeration and air conditioning for vital wartime industrial and scientific processes and for military and naval use. Most of the remaining production is for direct ordnance. Refrigeration and air conditioning are indispensable to such production as synthetic rubber, synthetic nitrates, smokeless powder, plastics, electronic devices, and optical equipment, and to the stratochamber, giant steel "vacuum bottle" in which stratosphere temperatures and air pressures are simulated. . . . York built its first refrigeration machine in 1885, and not long after gave up its original business of making water wheels and steam engines.

WAR PRODUCTION CHANGES SIGN OF PROGRESS

America can no longer afford to think of war production as a single problem. People must realize that overall war production consists of a number of distinct programs, some of which will continue to rise while others are reduced. One program reaches its peak long before another; and in modern warfare, with constant changes in battle requirements, production must always be kept flexible, and must follow the trends of military action. The fact that a number of programs go downhill while others still go up, is a healthy sign of the ability to meet the ever-changing requirements of total war.

We are coming into a period of complex readjustment in production. Facilities, materials, or manpower will be released in one segment of the war production program when it is vitally needed in another segment. Unless this is thoroughly understood by the American public, and particularly by those who produce war material, our production task in 1944 is bound to be hampered. People must not be allowed to gain the impression that a cutback in a single segment of production means a curtailment in overall production. It means no such thing. We can prevent confusion and move smoothly on our road only if America clearly recognizes that the adjustments and cutbacks which will be seen in 1944 are an essential part of our steady progress.

The chart shows the trend in overall war production, which includes production of munitions for our armed services, and construction of military establishments and bases, and of facilities for war industry. Our record breaking 1942 overall production is shown by the bar at the left. But you will note that the second bar, which represents 1943 production, is 50 per cent higher. And the fourth quarter of 1943, represented by the third bar, is 70 per cent higher than 1942. Finally, the last bar shows the dimension of the production task for 1944.



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The essential fact is that the 1944 overall schedules call for performance 80 per cent above our 1942 record. These schedules are continuously under review, and it is the constant effort of all of us who are concerned with them to see that we shall produce only things which are genuinely needed for the successful prosecution of the war. I believe that in general subsequent revisions will not be upward. But after carefully canvassing the matter with all of the procurement agencies concerned, I can offer you my considered opinion that barring unexpectedly early termination of the war in the European theater, such revisions will not substantially reduce our 1944 production below present levels. — *From a speech by Charles E. Wilson, WPB executive vice-president, on December* 8.

INSULATION MEN PLAN 2-FOR-1 PAPER SAVING

The serious paper shortage throughout the country can be greatly helped if other users follow the plan being adopted by the insulation industry, which is seeking a minimum goal of salvaging twice as much paper as used in the business, the National Mineral Wool Association reports.

The "two-for-one" program, the association points out, is the recognition by an important industry of its dependence on paper, and its resolve to participate as actively in the paper salvage campaign as its facilities will permit. While the insulation industry is a relatively small user of paper, the paper that it does require is vital in its operations. If other industries can salvage twice as much paper as the amount they must have to remain in business, the association comments, there will be no future threat to their operations, and the vast tonnage of salvaged paper needed in the war effort will be obtained.

SCHEDULE HEATING UP TIME TO SAVE FUEL

Structures such as schools that are heated intermittently offer some of the most difficult heating problems, says John Howatt, chief engineer of the Chicago board of education and member of HPAC's board of consulting and contributing editors, in a bulletin issued to school operating engineers last month. The continuous heating of a structure involves the provision of a heat supply to the building at a rate necessary to compensate only for the normal heat losses from the building. When a building that has been allowed to cool off must be heated, heat must be supplied at a rate that will compensate for normal heat losses plus the heat absorbed by the building structure and furnishings until their temperature has been raised to the desired room temperature. This heating up period takes time and increased heating load. The longer the time given to it the less will be the load on the heating plant, and vice versa. The time required will depend, too, on how far below desired temperature the room temperature is at the start.

Because of loss of radiant heat from the body to cold walls it is advisable to so plan the heating up of intermittently heated buildings that desired room temperature will be reached 30 min before occupancy, Mr. Howatt continues. This will insure the inside surface temperature of walls being nearer room temperature and eliminate excess chilling by radiation to them. Experiments have shown that it is not unreasonable to expect that 50 per cent of the heat supplied to a cold room in heating it up will be absorbed by the walls and furniture. The maximum economy in fuel and manpower will be obtained when the plant is operated to capacity so the heating up phase will be completed 30 min before occupancy. The operating engineer should work out a chart of the heating up time required for different outdoor conditions and indoor temperatures.

METAL SCRAP URGENTLY NEEDED, SAYS NELSON

An "open letter to industry" from WPB Chairman Donald M. Nelson:

As the war goes into its decisive phase, we must summon every effort to get the greatest hitting power to the right places at the right time. This means enormous expenditure of weapons and equipment. We have learned from each of our assaults on axis outposts, the heavy cost in war materials.

We are now producing more than 250,000 tons of steel a day . . . and half that steel comes to the mills as scrap. As we mount our greatest attack, our need for scrap becomes ever more pressing.

A year ago the nation rallied behind the scrap drive. Now we are asking you to "take another look." Vast quantities of iron and steel scrap are still available. The mills are only about two months ahead of the scrap supply. Any additional manpower shortage or unfavorable weather condition could produce another serious scrap shortage. *This must not happen!*

The War Production Board is relying on industry. You have the heavy scrap that is so much needed. And we are confident that you will come through as patriotically this time as you did before.

Reserves have been shrinking—a safe level must be maintained! Only in this way will we be sure that, come what may, we shall have *enough* weapons to deliver the final, crushing blow that will put the axis out of action.

MODERN SUBMARINES MUST HAVE AIR CONDITIONING

Air conditioning for all types of fighting ships, including aircraft carriers and submarines, has been the most urgently needed of York Corp.'s marine production, according to S. E. Lauer, president. By now, the entire U. S. submarine fleet has been outfitted with cooling equipment to prevent temperature and humidity from rising to a point where normal working efficiency is impaired. Lacking air conditioning, the modern submarine, with its increased amount of machinery and accessories, would be limited to much shorter periods of operation under water.

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Development of new sensitive detection devices and fire control mechanisms has made air conditioning essential for nearly all modern fighting ships, Mr. Lauer points out. Instrument and fire control rooms must be conditioned to protect both the delicate apparatus, and the men who operate it, against natural and artificial heat. Another use of air conditioning is in the ready rooms of aircraft carriers where pilots assemble in heavy gear to receive last-minute flying instructions.

APPOINTED TO PIPE COMMITTEE

J. P. McShane, of Swift & Co., has been appointed a member of the American Standards Association's committee on pipe flanges and fittings. The work of the committee covers the dimensional standardization (exclusive of screw threads) and designation of materials for pipe flanges and flanged and screwed fittings, for pipes carrying steam, gas, air, ammonia, water, etc. It also includes the standardization of face to face dimensions of ferrous gate, globe, angle, and check valves having flanged connecting ends and WSP ratings of 125 and 250 psi.

Some of the more recent standards approved by this committee are cast iron screwed drainage fittings (B16.12-1942) and ferrous plugs, bushings, locknuts and caps with pipe threads (B16.14-1943).

NAMES IN THE NEWS

L. O. Adams, formerly of the University of Louisville and a contributor to HPAC, is now administrative assistant at Northwestern University's Technological Institute. . . . A wartime conference for postwar planning was held recently by the Schaible Co., and representatives were appraised of the exact items which will comprise the company's expanded postwar line. . . Paul B. Reed, formerly service manager of the electric refrigeration and air conditioning division of Servel, Inc., is now with the Perfex Corp. as manager of its refrigeration and air conditioning division. . . . J. Harry Ebbert has joined Grant Wilson, Inc., as vice-president. . . . T. C. Knudsen has been named manager and chief engineer of the new "Texrope" department established by Allis-Chalmers Mfg. Co.; A. D. Robertson has been appointed assistant manager of the Allis-Chalmers motor division at the Norwood works in Ohio. . . . Oscar B. Coblentz, president of the Associated General Contractors, predicted last month at least $12,000,000,000 in new construction of all types in the first postwar year, with the rate climbing in a short time to $20,000,000,000 annually. . . . Lyman D. Warner is the new sales manager of the Crocker-Wheeler division of Joshua Hendy Iron Works. . . . Appointment of William O. Wilson as a commercial vice-president has been announced by Worthington Pump and Machinery Corp.

REFRIGERATION PIONEER PASSES

William O. Vilter, president of the Vilter Mfg. Co., died January 31 at Columbia hospital, Milwaukee. His career had extended over 62 years with the company and he had been actively engaged with its affairs until last November, when he became ill.

During a meeting of the company's board of directors held February 15, William B. Vilter was appointed a board member to fill the vacancy caused by the death of his father. Fred T. Goes was elected president of the company, being advanced from his former position of vice-president.

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AIR CONDITIONING AFFECTS CIVILIZATION'S COURSE

In modern times, the more advanced nations have been those at the upper fringe of the north temperate zone. The reason for this is that heat is enervating. But cold also is enervating, and the idea has been advanced that the advantage of the north peoples lay in the fact that man learned early to create a favorable climate for himself, in the midst of cold, by building weather-tight houses and using fire to heat them.

Lately he has learned to create a favorable climate in the midst of excessive heat by the use of air conditioning. It's more than a possibility that this may enable us to defeat in the future the enervating effect of the tropics just as we've already defeated the enervating effect of our northern winters. So our civilization, which has moved ever westward, may now, through the use of fuel and power, expand even more rapidly toward the north and south.—*from a talk on "new frontiers" given by R. T. Haslam, director, Standard Oil Co. (New Jersey) before the Baltimore Advertising Club on the occasion of the dedication of a new* 100-*octane plant.*

PIPING POINTERS GIVEN IN NEW MOVIE

A 30 min, 16 mm sound film entitled Piping Pointers has been issued by Crane Co., Chicago, and is available for showing in any plant, trade school, or industrial training center. In every industrial plant where piping is used, safe and serviceable maintenance of valves and fittings is indispensable, and the purpose of the film is to make available to industrial men practical information which has been developed in more than 89 years' experience.

In the illustration, taken from the film, the construction and features of a valve are being explained. The film includes information on piping terms; valve designs and operation; pipe fittings; handling valves, fittings, and pipe; how to make up various kinds of joints; how to install valves; what to do when valves leak; using ingenuity in piping maintenance work, etc.

HEATING INDUSTRY TAKES THE SHIRT OFF YOUR BACK

In its studies of family living as the basis for dwelling design, the John B. Pierce Foundation endeavors to avoid all preconceptions, even those implied in familiar terminology. As pointed out in one of the resulting publications, "to call a chair a 'surface for supporting the body in a seated position' was cumbersome, but it served as an excellent corrective to methods of thinking that are so traditional that they are ingrained even in our everyday language."

Another corrective to traditional concepts is to think of the family as an organism, with the dwelling considered as its clothing. The house supplies almost the same services for the family that clothing does for the individual: protection from the weather, privacy, adornment, and a place to keep belongings. The house—like clothing—must be tailored to fit.

The foundation traces the relationship further. As the house during the last generation has more and more successfully supplied a comfortable thermal environment for the family in cold weather, the need for thermal insulation in indoor clothing has lessened. Much of the insulation formerly worn on the back is now in the walls and roof of the house.

Research study 4 of this series is entitled Introduction to Studies of Family Living, by John Hancock Callender. It is published by the John B. Pierce Foundation, 40 W. 40th St., New York 18, N. Y.

DR. POTTER PREDICTS COAL SHORTAGE, SAYS REAL CONSERVATION IS VITAL

Dr. Charles J. Potter, Deputy Solid Fuels Administrator, predicted last month that on the basis of present trends bituminous coal production in 1944 would fall 20,000,000 tons short of requirements, a deficit "which we must meet by sound distribution and real conservation." He added that the 1944 anthracite production may be expected to be 5,000,000 tons short of meeting domestic solid fuel requirements in the mid-Atlantic and New England states.

He asserted that 1944 requirements had been carefully estimated at 620,000,000 tons. In describing the need for "sound distribution and real conservation" Dr. Potter warned that people in many parts of the country who were congratulating themselves on getting through the present winter without material distress had no reason "to feel secure with respect to next winter's supply" unless we can do some hard work this spring and summer. He said that we must "get down to brass tacks and really do something about saving coal. We have been talking conservation for a year or so. No doubt some coal has been saved, but I am satisfied that we have made no appreciable dent in the potential amount that could be conserved. The experience of some consumers in reducing their consumption of coal this winter has proved beyond a doubt that people can save a substantial amount once they are cognizant of the necessity for doing so and learn how."

He added that "it will be the policy of the Solid Fuels Administration to place conservation on a rank equally important with all other measures that we are to take in order to protect the fuel supply. We are now launching a vigorous coal conservation program."

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POSTWAR PLANS FOR A LARGE CITY

The postwar program committee of the Chicago Building Congress—of which Samuel R. Lewis, consulting engineer and one of HPAC's board of consulting and contributing editors, is a member—has evolved a preliminary program which it has divided into two categories. The first comprises objectives which "are of a direct, practical, and noncontroversial" character and the second comprises objectives and projects of a long-range character "which may be even more important than those under the first category, but because of their nature and circumstances surrounding them, may be either controversial or more difficult to accomplish."

As an example of the types of projects for postwar planning in large cities, the first category of the program includes early settlement of the traction problem, proceeding with the Congress St. superhighway project, completion of the work under the present subway program, early adoption of a superhighway program, construction of effective storm sewers and waterwork control for the south side, development of the medical center program, planning and preparation for necessary municipal building projects, development of a sound and integrated system of railroad and bus terminal facilities, and of municipal airport facilities.

In the second category, the committee favors state financial aid to municipalities in need of assistance for preparation of plans and specifications for essential public works, enactment of a law whereby engineering and architectural fees will be treated as deductible items of expense on income tax returns, determination of the constitutionality of all provisions of the neighborhood redevelopment corporation law, adoption of a workpile of planned projects by private enterprise, and development of a healthy private mortgage finance system.

NAMES IN THE NEWS

Carl F. Boester, housing research executive at Purdue and member of the ASHVE's committee on research, has been named one of the "10 outstanding young men of 1943" by the U. S. Junior Chamber of Commerce. . . . New director of the OPA's fuel rationing division, succeeding Joel Dean, is Albert R. Whitman, who comes to OPA from the Office of War Information. . . . H. McPherson, of Henry Valve Co., has been appointed to the American Standards Association committee on pipe flanges and fittings. . . . N. Downey has been elected president of the Industrial Unit Heater Association, and C. E. Scott has been named vice-president; L. O. Monroe is secretary-treasurer. . . . Tom Brown is now at the Eastlawn Sanitorium, Northville, Mich.

A new joint industry education enterprise at Purdue University for the intensive training of graduate students in exploring the field of heat transfer for data upon which many of the developments of the future depend has been made possible by a grant of $75,000 by the Westinghouse Electric and Mfg. Co.; Dr. George A. Hawkins has been appointed research professor in heat transfer, and Dr. Max Jakob, of Illinois Tech, will cooperate as nonresident research professor. . . . The new section of the American Society of Refrigerating Engineers in San Francisco has an approximate membership of 90 and is to receive its charter as the 16th local recognized group of the 39 year old society this month.

Carrier Corp. was cited last month by the jury of wartime advertising awards as having produced one of the most outstanding advertisements during 1943. . . . Major Raymond C. Gunther has been appointed officer in charge of the refrigeration school at the Quartermaster Replacement Training Center, Camp Lee, Va. . . . James S. Locke was named zone supervisor of the air conditioning controls division of Minneapolis-Honeywell Regulator Co. at Chicago last month, succeeding Karl W. Schick, who fills the newly-created post of national sales manager of the railroad controls division. . . . Edward R. Wolfert received recently a Westinghouse "order of merit" for outstanding contributions to the electrical and mechanical arts and to company progress. He holds 22 patents, many of them for electronic tube and air conditioning developments, and designed air conditioning equipment for the Illinois Central Railroad in 1933.

Dr. V. N. Krivobok, authority on stainless steel and formerly professor of metallurgy at Carnegie Institute, has joined the development and research division of the International Nickel Co. . . . Henry E. Hermann has been appointed works manager of the Bear Mfg. Co.; he has been plant engineer of the John Deere Plow Works . . . Charles Schwarzler has been named manager of Foxboro Co.'s export department, succeeding the late Henry B. Moelter. . . . R. P. Exten has joined the Young Radiator Co. as executive assistant to the president. . . . George W. Kelsey has been elected a member of the board of directors of Builders-Providence, Inc.; he also continues as general sales manager of the company. . . . George Bingham is the new personnel manager at Acme Industries, Inc. . . . General Controls Co. has opened a branch office at Atlanta under the direction of Roger W. Allen. . . . The Marley Co. is now represented in the Tulsa area by Walter S. Smith and his Process Equipment Co.

Malcolm Lund is handling wartime fuel conservation work with Perfex Corp. . . . G. Bronson Philhower was recently added to the staff of Tube Turns, Inc., New York office. . . . Albert J. Lilygren has been appointed Oregon and Washington representative for Kieley & Mueller, Inc. . . . N. M. Barnett has been named manager of the Chicago branch office of Bailey Meter Co., and Ralph T. Cowan has become manager of the company's Detroit office. . . . Walter C. Ahlers' appointment as Detroit district manager of SKF Industries, Inc., was recently announced.

The Editor's Pages

ESTIMATE $21.6 BILLION PER YEAR FOR NEW CONSTRUCTION AND MAINTENANCE AFTER WAR

Owing to the wartime shortage of many building materials and of manpower, expenditures for maintenance and repair of residential and other construction during the current year are expected to be about 17 per cent less than in 1943, according to a statement by James W. Follin, managing director of the Producers' Council, 815 15th St., N. W., Washington 5, D.C., based on a report by the council's market analysis committee. The estimated expenditure of $3 billion for 1944 would be less than in any year since 1939, in spite of the great accumulated demand for repair work, he said.

"The committee estimated that expenditures for maintenance and repair will rise to $3.9 billion during the first 12 months after the war, but even this total, which is higher than in any preceding year, will not be large enough to enable property owners to catch up with all necessary repairs," Mr. Follin stated. As a result, expenditures for this purpose during the next five postwar years are estimated at the unprecedented figure of $5.4 billion annually, on the average.

"It is believed that the amount of building materials and equipment available for repair and maintenance during the first postwar year will be reduced by the heavy demands for building products needed in new construction enterprises, particularly for the erection of new dwelling units.

"The estimated volume of repair and maintenance for the current year is greater, in proportion to the amount of new construction, than in any preceding year. However, it represents only part of the actual need, which is greater than usual on account of the abnormally intensive use being made of existing structures and the inability to replace or renovate them under wartime conditions.

"Adding the estimated $4.6 billion of new construction to the expenditures for maintenance and repairs, the total value of new construction and maintenance during 1944 would amount to $7.6 billion, or slightly more than one-third of the estimated average for the five-year period following the war, which will be $21.6 billion, according to the committee's forecast. The latter figure is based on the assumption that the cost of construction during the period in question will be 30 per cent higher than in 1940."

The forecasts are contained in a report on How to Plan Now for Tomorrow, issued by the council to assist building product manufacturers in estimating the probable postwar demand for their products.

UNIQUE TEAM HELPS SYNTHETIC RUBBER PROGRAM

An unusual manufacturing-retailing-civic war production team came to public notice last month. The "team" pooled its resources to help make synthetic rubber at a gigantic plant in Port Neches, Texas, which is just starting production.

The "civic" member of the team was the municipal auditorium of New Orleans, which released to the rubber program centrifugal refrigeration equipment of 700 tons capacity which formerly had comfortably cooled its crowds. The "retailer" members of the team were Mandel Bros. department store, Chicago; Gimbel Bros. department store, New York City; and the G. Fox department store, Hartford, Conn. They contributed equipment of a total of 1260 tons capacity. The "manufacturer" member of the team, Carrier Corp., Syracuse, N. Y., was the coordinator of the "pooling" plan.

The process of manufacturing butadiene for synthetic rubber is a matter of flowing gases through superheat, intense cold, and pressure. At one stage (in the first major step where butylenes are segregated from the original gases) the contents in the huge fractionating towers must be cooled. Here, the refrigerating machines from Mandel's, Gimbel's, G. Fox's and New Orleans do their share in the rubber program.

● *Large scale foreign maps and city plans are wanted by the Army; if you have maps or plans you think might be of value, write the Army Map Service, Corps of Engineers, War Department, Washington, D. C.*

Fuel-Saving Starts With CONTROL

. . . is the new slogan adopted by the automatic control industry to highlight its activities in national fuel conservation efforts. It has been endorsed as a valuable message by interested agencies in Washington, particularly in response to an extensive presentation on the fuel, material, and man hour savings which automatic controls make possible given last month in Washington by the Fuel Conservation Council for War of the Automatic Control Industry. The committee has headquarters at 500 W. Oklahoma Pl., Milwaukee 7, Wis.; M. W. Crew is its chairman, and C. W. Nessell is secretary.

Data assembled and charted by the committee show that the materials, production facilities, and production and installation man hours "invested" in automatic controls will be returned many times over in fuel savings, transportation savings, man hour savings, and money savings. The committee expects, it is understood, that government agencies will allocate materials for early production of thousands of controls of various types in order to aid fuel conservation and the war effort next winter.

The Editor's Pages

HOW TO KEEP WARM NEXT WINTER

The solution for the problem of keeping people warm next winter lies in the adoption by every consumer of a "down to the last ounce" coal conservation program, said Dr. C. J. Potter, deputy solid fuels administrator, in an address in New York City last month.

"If we are to get through the winter of 1944-45 without loss of war production and without widespread suffering because of lack of domestic fuel, every coal consumer in the United States must be completely convinced of the absolute necessity of conservation. He must be induced to practice conservation, and he must be thoroughly schooled in the most effective means of saving coal.

"We are up against some tough problems. But they are not entirely insurmountable. We can knock the edge off of them by working together to keep production at the highest possible level and to bring about an absolutely equitable distribution of what coal can be mined.

"We can whip these problems entirely," Dr. Potter concluded, "provided first that they grow no worse than currently indicated, and second, that we realize the full significance of conservation, and then put over that idea with the consumers."

FUEL EFFICIENCY DRIVE GETTING UNDER WAY

Regional engineers serving voluntarily in the National Fuel Efficiency Program, conducted in cooperation with the U. S. Bureau of Mines, will soon call on industrial plants and buildings to "sell" management on the necessity of eliminating waste of fuel (if fuel is being wasted), arrange for the appointment of a "waste chaser" in each establishment, and survey the premises in order to fill out a check sheet which will indicate any obvious sources of waste and serve as the basis for future estimation of fuel savings. Fuel users will be asked to sign a form for enrollment in the program, pledging to cooperate and agreeing to consider fuel saving recommendations.

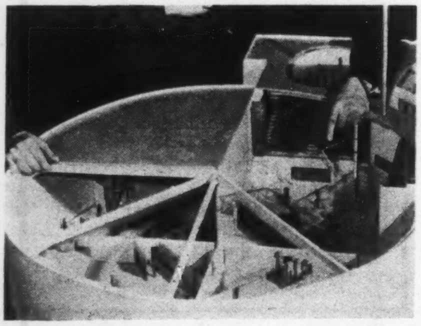
The entire campaign is to be conducted on a voluntary basis. It is supervised in each local area by a coordinator who is a voluntary worker, and the regional engineers who will call on plants and buildings are volunteers assisting in the conservation of all fuels and the prevention of waste in order to help win the war. Thomas C. Cheasley, supervising engineer, National Fuel Efficiency Section, Bureau of Mines, Washington, D. C., heads the campaign.

IBR ENGINEERS REVIEW RESEARCH

New standards of convenience and efficiency in postwar hot water and steam heating plants are indicated by research activities reviewed and discussed at a recent meeting of the engineering representatives of the Institute of Boiler and Radiator Manufacturers. Reports were presented on the IBR research program at the University of Illinois and plans were outlined for its continuation. The draft of an installation guide based on the findings of the program were reviewed. At a session held at Battelle Memorial Institute, attended by representatives of Battelle, representatives of Bituminous Coal Research, Inc., representatives of coal companies and coal hauling railroads, and engineering representatives of the institute, there was an exchange of data and views on improved methods of firing bituminous coal, both manually and automatically, as well as related subjects such as grate design, coal sizing, and chimney heights.

TELEVISION STUDIOS

A working model of television studios designed for the postwar broadcasting of regular commercial network programs with large studio audiences was exhibited by engineers of the Austin Co. last month. It has a turntable stage and unique layout which make it possible to accommodate rapid changes of scene and audience without duplication of costly television equipment. Lighting, noise, and atmospheric conditions are subject to complete control in all parts of the building, which utilizes special insulated wall and roof construction developed for the efficient, economical air conditioning of large windowless, controlled conditions, industrial plants.



To provide for a "united front" for educational and promotional activities on behalf of steam and hot water heating, the members of the IBR have approved an amendment to the constitution of the institute which provides for two classes of membership, member and associate member. Heretofore there has been only one class of membership which comprised the manufacturers of cast iron heating boilers and radiators. Associate membership will include manufacturers of other appliances or equipment related to the boiler and radiator industry or to the operation of steam or hot water heating systems.

TRAINING FILM EXPLAINS THE STEAM CONDENSER

As a sequel to its educational film on steam turbine operation, The Magic of Steam, Allis-Chalmers Mfg. Co., Milwaukee, announces the release of a new movie, The Surface Condenser. Shown in this film are the step-by-step construction and operation of the modern surface condenser. The condenser's part in the steam cycle of a power plant is explained by diagram, cutaway view, and animation.

● *E. C. Englert has been elected president of the Propeller Fan Manufacturers Association, and Wallace Allen has been named vice-president; the secretary-treasurer is V. C. Shetler.*

The Editor's Pages

WAR BOND FACTS AND FIGURES

The Fifth War Loan begins June 12, closes July 8.

The goal will be $16,000,000,000, of which six billions will be sought from individual investors.

More than 55,000,000 Americans own at least one war bond. That's an average of better than 1½ bond owners for every U. S. family.

Total sales in the four war loan drives, plus the sales of savings bonds, aggregate more than 87 billion dollars. Three weeks after Pearl Harbor it was only 2½ billions.

Individual investors purchased 32½ billions of the total—13 times more than their holdings in December 1941.

Single "E" Bonds sold—separate pieces of paper—total more than 500,000,000. That's a 38-time increase since Pearl Harbor.

Sales of $25 bonds alone have jumped to 346 million pieces. That's 69 times the number of dollar bills in circulation.

27,000,000 Americans are putting almost 10 cents of every dollar they make into war bonds every pay day. They're plowing back into the war effort 475 million dollars a month.

During the war loan drives more than 5,000,000 unpaid volunteers ring doorbells and pound pavements to get their sales.

You can buy war bonds or war stamps in any one of a million places during the Fifth War Loan drive.

More "E" bonds—the smaller ones for the small investors—were sold in the Fourth War Loan than ever before—69,900,000 individual transactions that brought in $3,187,000,000.

To reach this total sales of "E" bonds averaged $63,740,000 every working day.

Putting it another way, sales of "E" bonds during the Fourth War Loan averaged $24.56 for every man, woman, and child in the nation. This was $5.35 more than the average for the Third War Loan.

Because so many people contribute their time, office space, and other assistance, war bond sales' cost to the government is only one cent for every 33 dollars raised.

Of every $100 Americans saved in 1943, they loaned 44 to the government to help pay for the war.

URGES HEATING PLANT CHECKUP NOW

This is the maintenance equation offered by the Plumbing and Heating Industries Bureau as a means of emphasizing the importance of prompt attention to summer care of the heating plant:

$$\frac{\text{Too little}}{\text{Too late}} = \text{Too bad}$$

Arrangements should be made now by every owner of income property to have the heating plant checked by a competent heating contractor so that it will be in good running order for the next heating season, says the bureau. Prompt action to insure a proper heating plant checkup is more necessary this summer than ever before because of the shortage of good workmen and repair and replacement materials. The need for having every heating plant put in good running order for the opening of the 1944-45 heating season, too, is more urgent this summer than ever because of the importance of fuel conservation. There is every indication that the shortage of all types of fuel will be at least as great next winter as it was last winter and there is a possibility that the coal shortage may be more acute.

The first step in getting the heating plant ready for the next heating season is a thorough cleaning. Not only should the boiler flues be cleaned and all soot and fly ash removed, but the interior of the boiler, too, should be cleaned by the use of a good boiler cleaning compound, says the bureau. A clean boiler heats faster, uses less fuel.

The type of servicing which a heating plant needs in the fall depends upon whether it is automatically or manually fired. The inspection of a hand fired plant should start with the grates. Broken or warped grates which permit unburned coal to drop into the ashes should be replaced. The condition of the firebox, the draft mechanism, the smoke pipe, and chimney should be checked.

If the system is oil fired, the inspection should include a thorough examination of the burner, a flue gas analysis, and a check of the refractory brick. It is also advisable to test the accuracy of the tank gage to be sure that oil will not be spilled in filling the tank too full. The operation of dampers and draft controls as well as thermostats and aquastats should also be checked.

Every automatically fired boiler should be protected against excessive pressure by a relief valve. Furthermore, it is advisable to equip steam boilers with an automatic water feeder to protect the boiler against the hazards of a low water level.

The third step includes an inspection of piping, radiators, and valves as a check on the overall efficiency of the plant. The operation of air valves should be checked particularly on steam heating plants. Defective valves should be replaced.

While some heating plants may need only a thorough cleaning and checking of automatic controls, others may need major alterations and the addition of new equipment or accessories which will result in greater fuel economy and a better distribution of heat. Some boilers may need additional sections.

The Editor's Pages

WAR BONDS FOR PLANT OPERATING IDEAS

War bonds have been awarded to three Ilg Electric Ventilating Co. employees whose suggestions were judged most valuable to plant operation in 1943. The prize winning suggestions were:

The use of steel bands instead of wire on armatures of motors. Production time saved, 8 min per armature. Previous operation was placement of a number of turns of wire on commutator end of armature with solder applied where necessary for dynamic balancing. Now the wire has been replaced by tinned steel band, eliminating time used in wrapping.

Put motor covers on after final testing. Time saved—35 man hours per week. Formerly, the covers were put on motor heads at time of motor assembly; this necessitated removal of motor cover for first test, again for painting, and once more for final motor tests. Now, the motors proceed through testing department at the same time the covers are being painted. After final tests, covers are mounted on motor.

The use of spray guns to stencil the many thousands of spare parts boxes to contain equipment being furnished to the Navy and Maritime Commission. Formerly done by hand brush, job is now done quicker, is more legible and uniform. Saves many hours per week.

RAILROAD ASSOCIATION REPORTS ON FILTER FIRE

The fumes which overcame passengers on a New York-Florida Pullman car leaving Washington union station early on the morning of Sunday, April 2, were not monoxide or other poisonous gases but smoke from the accidental igniting of an oiled filter pad at the intake to the air conditioning system, investigation by authorities of the Washington Terminal Co. and the Pullman Company disclosed, according to the Association of American Railroads. Those who investigated the accident are unable to account for the source of the fire, which, so far as is known, is the first time that one of these pads has become ignited during the several years in which cars have been air conditioned.

The car DeWitt in which this particular incident occurred is cooled by ice and there is no gas of any sort used. In those Pullman cars in which the mechanical compressor system of cooling is used, the gas employed is non-poisonous and non-inflammable, so that an accidental leak would produce no harmful results, according to the association.

SCHELLENBERG HEADS REMA

Arthur B. Schellenberg, president of Alco Valve Co., was recently elected president of the Refrigeration Equipment Manufacturers Association. The other officers are F. J. Hood, Ansul Chemical Co., vice-president; George R. Allen, Mueller Brass Co., secretary; and J. A. Strachan, Weatherhead Co., treasurer.

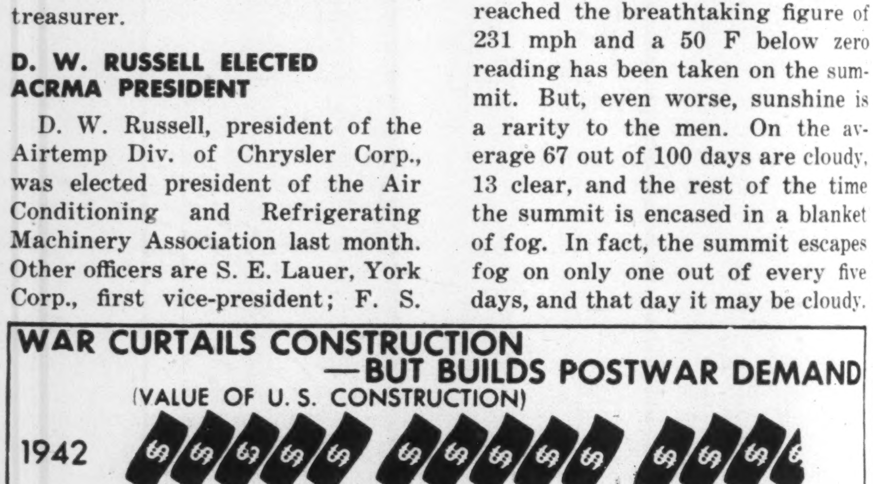
D. W. RUSSELL ELECTED ACRMA PRESIDENT

D. W. Russell, president of the Airtemp Div. of Chrysler Corp., was elected president of the Air Conditioning and Refrigerating Machinery Association last month. Other officers are S. E. Lauer, York Corp., first vice-president; F. S. McNeal, Universal Cooler Corp., second vice-president; and P. A. McKittrick, Parks-Cramer Co., treasurer. C. E. Wilson, Worthington Pump and Machinery Corp., was elected to the chairmanship of the ACRMA board of directors. Miss Mary Jane Stewart continues as secretary of the association, with headquarters in the Southern Bldg., Washington 5, D. C.

EVER KICK ABOUT THE WEATHER?

The most unique working environment of any American war workers may be claimed by the staff of the Mt. Washington (N. H.) weather observatory who literally work with their heads in a cloud. The observatory is atop the 6300 ft mountain. For months these men, in connection with their regular routine, have been testing electrically heated flying equipment developed by the General Electric Co. for the Army Air Forces.

The velocity of the wind has reached the breathtaking figure of 231 mph and a 50 F below zero reading has been taken on the summit. But, even worse, sunshine is a rarity to the men. On the average 67 out of 100 days are cloudy, 13 clear, and the rest of the time the summit is encased in a blanket of fog. In fact, the summit escapes fog on only one out of every five days, and that day it may be cloudy.



PICTOGRAPH CORPORATION

URGES EVERY EFFORT TO INSTALL CLASS A STOKERS

In a bulletin issued last month to its members, the Stoker Manufacturers Association urged that every effort be put behind the sale of commercial and industrial stokers (Class A) in order to save fuel—a vital wartime job.

Rumors floating around the industry, particularly among dealers, as to residential size stokers being available soon are completely unfounded, according to the SMA, and are based on wishful thinking. Such rumors only detract from the important war job of saving fuel by the sale and installation of the commercial and industrial units, the association said.

HOMER ADDAMS AGAIN HEADS SHBI

The Steel Heating Boiler Institute has re-elected Homer Addams its president; Mr. Addams is president of Fitzgibbons Boiler Co., Inc.

R. B. Dickson, president of Kewanee Boiler Corp., was elected vice-president of the SHBI, and W. J. Parker, secretary-treasurer and Montie L. Heminway, executive secretary, were re-elected. J. E. Axeman, general sales manager of the Spencer Heater Div., was made a member of the executive committee.

IBR RENEWS CONTRACT FOR RESEARCH PROGRAM

Renewal of the contract for the research program at the University of Illinois, approval of a joint all-industry promotional program for hot water and steam heating, and enlargement of statistical activities were highlights of a special meeting of members and associate members of the Institute of Boiler and Radiator Manufacturers at Dearborn, Mich., recently. This was the first meeting attended by the associate members of the institute, consisting of manufacturers of controls, hot water and steam specialties, and allied products.

In reporting on research activities, J. P. Magos stated that it was hoped to obtain sufficient data on one and two pipe hot water systems during the coming year, so that after this year a complete change in the system will be possible for the development of wider accomplishments in the IBR research program.

H. F. Randolph reported on the IBR Installation Guide. He said that the purpose of the guide is to make available to all those interested the benefit of the facts which have been developed during the past 3½ years at the IBR research home. The first guide, shortly to be published and which covers one pipe hot water heating, is the forerunner of other guides which his committee plans to develop so that eventually various types of systems for various sizes of structures will be available.

ARCHITECTS AND PRODUCERS' COUNCIL COOPERATE

To establish active collaboration on technical questions between architects and manufacturers of building products, a joint technical committee has been formed by the American Institute of Architects and the Producers' Council. At the committee's first meeting, a comprehensive agenda was adopted, providing for joint effort with respect to encouraging the adoption of dimensional coordination, revision of local building codes, and stimulating use of the new bidding practice for building materials which replaces the "or equal" clause. Preparation of standard specifications, coordination of building materials, and the creation of a technical services bureau were other projects included in the agenda.

THE EDITOR'S PAGES

Committee members representing the architects indicated a desire for information regarding the nature of building products which will be available for postwar construction and the details concerning new or modified products on which design information now is available.

HUGH E. KEELER ON PIPING COMMITTEE

Professor Hugh E. Keeler of the mechanical engineering department at the University of Michigan has been appointed a member of the American Standards Association's pressure piping code committee.

The work of this group covers the design, manufacture, test, installation, and operation of pressure piping systems.

"ENGINEERS GET THINGS WRONG FASTER"

Engineers can get things wrong, too, said Architect (and Toastmaster) Roger Allen at the semi-annual meeting dinner of the American Society of Heating and Ventilating Engineers in Grand Rapids last month, the only difference being that they get things wrong faster than architects because the engineers use slide rules.

HEATING AND AIR CONDITIONING SHOULD EXERT MORE INFLUENCE ON BUILDING DESIGN

Heating and air conditioning engineers and contractors should insist on proper building construction, particularly with regard to the correct insulation of the structure, various other methods of preventing heat loss in winter and heat gain in summer, best location of air outlets, etc., for it is the heating and air conditioning installations that suffer if items such as these are neglected. Factory sash, for example, is fine in a factory, but because of air inleakage may present a serious heating problem in an office, where the occupants are not physically active, are more lightly dressed, and are thus more susceptible to cold drafts.

It is ridiculous, in the opinion of Lester T. Avery—of the Avery Engineering Co. — that heating and air conditioning engineers and contractors do not insist more than they do on better design and construction of all types of buildings in order to make the heating and air conditioning of those buildings not only economical but satisfactory. Too often, he feels, other and less important considerations than heating and air conditioning are incorrectly allowed to influence the decision.

THE EDITOR'S PAGES

HELP THE WAR EFFORT AND SAVE MONEY TOO

It is essential that coal and other fuels be conserved and all waste of fuel be eliminated, in view of the estimated coal shortage this coming winter. One good thing about saving coal for the nation is that you save money for yourself, Joseph Harrington, combustion expert, points out. The money saving continues indefinitely, month after month. A ton of coal burned needlessly is the same as shoveling the equivalent in dollar bills into the boiler.

ICI HAS NEW EXECUTIVE SECRETARY

Arthur E. Schanuel has been appointed executive secretary of the Indoor Climate Institute, according to P. B. Zimmerman, president of the organization. Mr. Schanuel resigns the position as secretary of the National Electrical Manufacturers Association to assume his new duties. He is a former newspaper and advertising man and has a wide acquaintanceship throughout the building and public utility fields.

"With the appointment of Mr. Schanuel, the ICI rounds out its first year with a complete program of organization and the establishment of policies which should give great scope, of far reaching value to the institute's operations," stated Mr. Zimmerman. In this connection, the ICI has issued a progress report to its members, supplemented by a question and answer bulletin which clarifies the manner in which the institute will function under a committee form of structure.

The institute has moved into new offices in the Penobscot building, Detroit, Mich.

ELIMINATING WASTE IN WELDING SHOPS

A busy war plant has found it profitable to send a man through the welding shops to see that all oxy-acetylene equipment is turned off during the lunch hour on each shift and to close master manifold valves during these periods, says the current issue of Oxy-Acetylene Tips.

Numerous shops have appointed one man in the tool crib to repair all leaks in hose lines, joints, and connections, and to renew worn packing in gland nuts on blowpipes and other equipment. In most cases, the same man who tests the apparatus for leaks makes the necessary repairs.

A walking apparatus repair man is the idea of a manufacturer employing hundreds of oxy-acetylene operators. He either makes the repair on the spot or hands the operator a reconditioned piece of apparatus and returns the damaged one to the storeroom. Only minor adjustments and repairs are attempted, however, since major or extensive repairs to oxy-acetylene apparatus are a job for the trained experts of the manufacturer.

FUEL CONSERVATION MANUAL AVAILABLE

A new fuel conservation manual, prepared by the Fuel Conservation Council for War, is the result of cooperative effort of the manufacturers of automatic controls who are members of the council. It indicates the purpose and application of the various types of controls in relation to the big national fuel conservation job just ahead. Non-promotional in nature, the manual treats its subject from the educational and practical approach.

According to M. W. Crew, chairman of the council, there has long been a need for an impartial objective publication of this type. This need was recognized last year when the industry began to work with the government bureaus concerned with the problem of conserving fuel. Consistent with the controls industry slogan, "fuel conservation starts with control," this book indicates how controls are a dominant factor in fuel economy. It is part of the control industry's broad program in support of the national fuel conservation effort.

The book is available upon request from the Fuel Conservation Council for War, 500 W. Oklahoma Ave., Milwaukee 7, Wis., or through any of the 26 manufacturers identified with the council.

COMMENT AND SUGGESTIONS WELCOME

We publish each month discussion and comment on articles which have appeared in HPAC, and on other topics of interest. Readers are invited to submit their views for publication to The Editor, Heating, Piping & Air Conditioning, 6 N. Michigan Ave., Chicago 2.

? Which of the articles published this month most interests you? On what subject would you like to see more articles? The Editors would like to know, as it will be helpful in developing material for future publication, will aid them in editing HPAC to meet your every-day needs and interests. Your cooperation in filling in and returning the coupon will be appreciated.

The Editors,
Heating, Piping & Air Conditioning,
Six North Michigan Avenue,
Chicago 2, Illinois.

The following article in the July 1944 HPAC most interests me:

....

....

I would like to see more articles on the subject of:

....

....

Name.. **Title**..............................

Address ....

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THE EDITOR'S PAGES

COAL SAVED BETTER THAN THAT MINED

A ton of coal saved from waste is better than a ton of coal mined, for it not only reduces the demand on the miners but saves transportation just that much, saves the owner the cost of that ton, and saves the operating crew the handling of the coal and ash, says Joseph Harrington, combustion expert, in the publication, Chief Engineer.

Thousands of tons of coal can be saved by eliminating preventable waste, he says. As a preliminary check, the chief engineer should be sure he has no broken grate bars, that the doors around the boiler fit properly and shut tightly, that the boiler damper will open and close easily and can be set to remain in any desired position, that gages read accurately, that firing tools, coal scales, etc., are in good order, that there are no air leaks around the breeching or the base of the stack, that there is enough light around the front of and behind the boilers so you can see what's going on, that blowoff valves don't leak and safety valves don't sizzle, that the feed pump isn't leaking at every gland, and that there is a record book for keeping track of evaporation, steam cost, and fuel use.

RATING CODES FOR STOKERS ESTABLISHED

After more than two years of study, conferences, and investigation, the stoker manufacturing industry, through its national organization, the Stoker Manufacturers' Association, 307 N. Michigan Ave., Chicago 1, has established standard codes for the determination of rated capacities of both bituminous and anthracite underfeed stokers, it was jointly announced last month by J. M. McClintock, president of the association, and A. O. Dady, chairman of its engineering and research committee. Mr. McClintock stated that the adoption of these codes is a further step in the stoker industry's program of standardization and establishment of recognized and authoritative uniform methods covering the technical application of stoker equipment.

These particular codes provide a uniform method for the testing and rating of underfeed stoker equipment up to 1200 lb per hr of coal capacity and were unanimously approved and adopted at the recent annual meeting and war conference of the SMA.

Under the provisions of the codes, the manufacturers complying with the SMA standard rating guarantee that their equipment in the various sizes and models will feed and burn coal or coals of a standard specification or specifications and under certain draft and operating conditions at the rated capacity in pounds per hour continuously "when properly installed, adjusted, and attended in furnaces no smaller than specified in the SMA recommended furnace dimensions."

The establishment of the codes is expected to lessen materially confusion in the trade and among users, and to reduce or eventually eliminate complaints over failure of stoker equipment to meet rating claims, Mr. Dady said.

Simultaneously with the release of these new codes, Mr. Dady also stated that the association's engineering and research committee is trying hard to complete work on a new stoker engineering and technical manual, for publication and distribution as early as possible. This new manual will incorporate the various SMA standards and recommendations, as well as other technical and practical information designed to be of the greatest possible value to the users of stoker equipment, to consulting engineers, architects, heating contractors, installers of heating equipment, distributors and dealers of stokers, and stoker manufacturers. These are the people who have the everyday job of matching and applying stokers to various types, kinds, sizes, and designs of boilers and furnaces burning various types and ranks of bituminous and anthracite coals.

NECESSITIES OF WAR AID EFFICIENCY

Wartime controls and regulations, irksome as they are, are teaching us many things which are going to be of value to peace-time industry and business. Those government reports and questionnaires, and data assembled by different industries and individual companies in connection with materials and manpower problems have provided facts and figures which should have been available in the normal course of events but which—save for the stresses and strains of war—would never have been compiled.

A prominent retail coalman said the other day that when the Office of Defense Transportation told him they were going to make him operate his trucks more efficiently, he thought the ODT people were crazy —for it was a problem he'd been trying to solve for 20 years. But although the paper work and the records he keeps now require the services of an extra book-keeper, he could hire three book-keepers and still save money through better operation which was forced upon him by war but would still be good business in normal times.

The same holds true in better operation and maintenance of heating systems in order to conserve fuel. Even if no shortages of coal, oil, gas, or wood existed—and if transportation and manpower were ample—it still would be good business and good engineering to save every unit of fuel possible. Wasting fuel is like throwing the equivalent money value in dollar bills out the window. The war makes it a patriotic duty to eliminate fuel waste. But it's always good business and money in your pocket to conserve coal, oil, gas, or wood by heating efficiently.

MORE FUEL CONSERVATION COORDINATORS NAMED

A listing of the coordinators appointed to conduct the National Fuel Efficiency program in cooperation with the U. S. Bureau of Mines was published on pages 400-401 of the July HPAC. Since that time, a number of coordinators for other areas have been named, as follows:

Connecticut

New Haven Area—Allen Hubbard, 275 Orange St., New Haven.

Florida

Orlando Area—A. P. Michaels, Room 202, Church-Main Bldg., Orlando.

Illinois

Bloomington Area—C. C. Williams, Superintendent, Water and Light Dept., Bloomington.

Elgin-Aurora Area—George C. Ensign, Chief Engineer, Elgin National Watch Co., Elgin.

Rockford Area—K. A. Scharbau, Eclipse Fuel Engineering Co., Rockford.

Indiana

Fort Wayne Area—R. W. Noland, 3709 Shady Court, Fort Wayne.

Indianapolis Area—Max A. Tuttle, Combustion Engineer, Knox Consolidated Coal Corp., 1456 Consolidated Bldg., Indianapolis.

Jasper Area—Adam L. Bishop, Superintendent, Municipal Utilities, Jasper.

Terre Haute Area—Dr. P. D. Wilkinson, Professor of Chemistry, Department of Science, Indiana State Teachers' College, Terre Haute.

Louisiana

New Orleans Area—J. M. Guillory, Manager, Industrial & Commercial Engineering Div., New Orleans Public Service, Inc., New Orleans.

Massachusetts

Worcester Area—Arthur J. Staples, Superintendent, Heat and Power, Dept. of Mechanical Engineering, Worcester Polytechnic Institute, Worcester 2.

Michigan

Jackson Area—Geo. C. Daniels, Mechanical Engineer, General Engineering Dept., The Commonwealth & Southern Corp., 212 Michigan Ave., W., Jackson.

New Hampshire

Laconia Area—Warren B. Gifford, Laconia.

New York

Jamestown Area—F. Kenneth Rice, Jamestown Industries, Inc., Jamestown.

Watertown Area—F. W. Aikin, President, Northern Controlled Heat Co., Inc., Watertown.

North Carolina

Winston-Salem Area—G. A. Morris, District Manager, Coal Bureau, Norfolk & Western Ry. Co., Coal Traffic Dept., 1105 Reynolds Bldg., Winston-Salem.

Wisconsin

Rhinelander Area—F. W. Johnson, Operating Manager, Rhinelander Paper Co., Rhinelander.

Wausau Area—Cal Clark, c/o Thiry-Clark & Combustion Engineering Co., Mead Witter Block, 252 W. Grand Ave., Wisconsin Rapids.

AIR CONDITIONING PLAN FOR CONGRESS PROPOSED IN 1791

The New York Times printed last month a letter written by a John Carey to Thomas Jefferson in 1791, in which he suggested that air for the halls of Congress first be passed through "heaps of saltpetre" in the basement and, as "saltpetre is universally known to be a very powerful refrigerant" the air would be "cool & fresh, & purified . . . from . . . noxious particles, of which the frost happily rids us each winter." To promote the influx of cool air from the saltpetre rooms, the writer also suggested that a stove be placed over the ventilating opening in the roof or dome of the building to "accelerate the circulation of the whole volume of air, between the saltpetre rooms and the roof."

Mr. Carey's letter was found in the Massachusetts Historical Society by Dr. Julian P. Boyd, of Princeton University, editor of the proposed 50 volume edition of Jefferson's works and letters undertaken jointly by Princeton and the Times. HPAC is indebted to E. P. Heckel, consulting engineer, for calling our attention to this novel idea for cooling a building by means of saltpetrous air drawn upward through ducts by stove heat.

THE EDITOR'S PAGES

WAR FACTORIES A SMALL PART OF POSTWAR NEEDS

Government war plants constructed to date amount to but a fraction of our "going civilian production capacity," according to Louis Kahn, president of Albert Kahn Associated Architects & Engineers, Inc., in an article published recently in the magazine Nation's Business. Economists say we must—and can—double our prewar production output, which implies a much greater increase in production facilities than the small fraction provided by the government—and even this latter embodies plants of exclusive wartime utility which are not adaptable to civilian production and will not be converted, he pointed out. Also, said Mr. Kahn, there must be deducted a large number of the "five year plants," and those plants which will remain under government control. What remains for possible civilian conversion after the war is insignificant in relation to our total production plant and to offset this small increase are those plants which were producing before the war but which will not again manufacture civilian goods because of obsolescence.

Mr. Kahn concluded his discussion by saying that modern production managers know they can no more compete in obsolete plant housing than a motor freight carrier can operate properly with old equipment. Therefore, "industrialists will spend money for new construction because they will more than get it back in low cost selling." Building contract awards disclose that in the 30's construction of all types was only a fraction of that of the 20's and that it wasn't until 1942, under the full force of the war program, that the total soared about one-third larger than the annual average in 1927-29. Assuming the rate of building in 1942 was sustained in 1943, we will have accumulated a two year bulge of less than $4,000,000,000 to apply against the continuous annual deficit since 1929 in normal construction, he estimates. Thus, it seems likely that "the total amount of war plant floor space likely to compete with the tremendous going production of America will be small."

"GREATEST VOLUME" OF INDUSTRIAL BUILDING SEEN; AIR CONDITIONING WILL BOOST OUTPUT

In the first three to five postwar years the United States will experience the greatest volume of industrial building and greatest employment of construction workers of any similar peace-time period, S. M. Rust, Jr., vice-president of the Rust Engineering Co., predicted last month. This building will start in large volume immediately after war restrictions are relaxed, as industries rush preparations to skim the cream from postwar markets, he said.

Thousands of inquiries and orders for designs of new plants and alterations of existing plants have been, and are being, received by engineering firms throughout the country, Mr. Rust said, providing a solid, factual basis for his assertions.

The type of designs most usually sought, he further commented, are "master plans"—not for single structures but covering all the building and development contemplated by the firms concerned for five or more years. He stated that contrary to popular belief, our tremendous construction of war plants will not halt or make unnecessary extensive postwar industrial building.

"The effect will be just the opposite," he said. "The huge competitive potentialities of these plants will force industrial management to modernize to the limit and to build many entirely new plants in order to stay in the running. Scientifically designed mass production is being projected in every conceivable field."

"Improved working conditions will increase output," he predicted. "These will include air conditioning, automatic dust removal, improved lighting, maximum cleanliness, soundproofing, cheerful cafeterias, facilities for instructional movies, arrangements of parking lots and entrances to eliminate lost time between portal and machine.

"Attractive exteriors, utilizing new materials, will be real estate assets in their neighborhoods.

"The major part of this new building, according to inquiries received, will be devoted to large additions, alterations and conversions at existing plants, but a considerable percentage will consist of new plants. The fabricating field, especially those dealing with new developments, will account for the largest percentage of the postwar construction effort.

"Certain raw material plants, producing steel, nonferrous metals and basic chemicals, will be least subject to change.

"Whatever alterations or new plants are contemplated, postwar engineering is largely being undertaken on the basis of master plans to cover all developments in a given period. Such plans frequently provide for a more or less continuous program of building for a number of years."

INDUSTRY PROGRAM EXPLAINS OIL RATIONING

A comprehensive program of inter-industry public relations, designed to win friends for the petroleum industry by creating genuine understanding of the need for fuel oil rationing, has been inaugurated among 35,000 fuel oil distributors and their employees by a special subcommittee on fuel oil rationing of the Petroleum Industry War Council, 50 West 50th St., New York, N. Y., it was announced last month by J. W. Connolly, of the Standard Oil Company of New Jersey, chairman of the committee.

The program will present the fuel oil situation "properly and continuously to the distributor and to his employees." It also provides a wide range of information material, designed to help the distributor in presenting these facts to his customers.

In outlining the necessity for the campaign, Mr. Connolly said: "Today the fuel oil industry stands high in public opinion. Eighty-two per cent of fuel oil consumers, according to a comprehensive survey, believe fuel oil rationing has been well handled. But an analysis of public opinion also shows that many people believe the war in Europe will soon end, and that further rationing will not be needed. We hope this will be the case. But we cannot afford to bet our business goodwill and reputation on it."

THE EDITOR'S PAGES

ELECTRONIC TUBE CHEMICALS GET AIR CONDITIONING

A new air filtration system recently installed at the Dobbs Ferry plant of North American Philips Co., Inc., controls the atmosphere in the new factory laboratory where phosphors are prepared. These coatings are used in cathode ray tubes and the chemicals must be maintained at an exceptionally high degree of purity—contact with the ordinary atmosphere would contaminate them. Installed as part of the air purification system is an electrostatic air cleaner which removes dust particles as small as 1/250,000th of an inch in diameter.

CORROSION COMMITTEE ELECTS OFFICERS

At the sixth annual meeting of the American Coordinating Committee on Corrosion held recently in New York, Frank L. LaQue, of the International Nickel Co., was elected chairman for the current year. Dr. George H. Young, Mellon Institute of Industrial Research, was named vice-chairman, and George W. Seagren, also of Mellon Institute, was elected secretary-treasurer.

This group was organized in 1938 to serve as a clearing house and coordinating agency for information on American experience and American work in progress in the field of corrosion and corrosion prevention, and to act as an agency for the exchange of corrosion information and experience with similar foreign agencies. It also serves as a medium through which individual workers may make contact with other investigators here and abroad in specific fields of corrosion work.

SAVING FUEL IN BUILDINGS

The "plan of action" for an industry drive for fuel conservation prepared by a committee of the National Association of Building Owners and Managers provides for the development of fuel conservation programs by each local association designed and organized to meet the conditions of each locality in order to be as effective as possible.

Savings may be accomplished in one or more of the following steps, it is stated:

1) Increase in boiler plant efficiency.

2) Increase in heating system efficiency through overhauling of the system and the installation of control apparatus where necessary.

3) The elimination of overheating in offices.

4) Shortening of the hours of heating through cutting down the schedule of heating hours for various temperatures, particularly during the milder weather when the greatest amount of waste occurs.

5) Reduction in the inside temperature in offices below that normally maintained.

Earle Shultz is chairman of the NABOMA's fuel conservation committee, and L. W. Mauger is vice-chairman. R. E. Hieronymus, member of HPAC's board of consulting and contributing editors, is one of the committee members.

PROMPT RESUMPTION OF CONSTRUCTION URGED

A committee of the construction industry, brought together by the Chamber of Commerce of the United States, met last month with Donald M. Nelson, WPB chairman, to emphasize the need of prompt resumption of construction as labor and materials become increasingly available.

The construction industry, the committee pointed out, realizes its responsibility as one of the first industries which must get started to sustain employment as war work eases off. The committee told Mr. Nelson that several months would be saved in the resumption of all types of construction work if the industry could be given assurance that necessary equipment for buildings and other structures, as well as building materials, could be produced and permitted to flow through industry channels as rapidly as war needs permit.

Since the pipe lines of building equipment are nearly empty, it will be essential, the committee declared, to start filling them at the earliest practicable time, to give encouragement to the start of construction work.

H. C. MURPHY NAMED SALES DIRECTOR

H. C. Murphy, vice-president of American Air Filter Co., Inc., and a member of HPAC's board of consulting and contributing editors, was recently appointed general sales director of the filter company. Other changes in organization, made necessary by the growth and expansion of the company's business, include the appointment of W. G. Frank as assistant to the president, W. M. Reed. John Hellstrom, vice-president, continues as head of the dust control division, Howard W. Pound is in charge of the air filter division, and Wm. K. Gregory directs the special products division.

ASA APPROVES SCREW THREAD STANDARD

So that Whitworth screw threads may be produced more easily by American manufacturers while maintaining complete interchangeability with threads of British Standard Whitworth form, the American Standards Association has approved a new war standard, Screw Threads of Truncated Whitworth Form, Bl.6-1944. Requested by the WPB last year, this standard gives complete specifications including gaging instructions, for American Truncated Whitworth Threads, which (1) are interchangeable with British Standard Whitworth Threads; (2) can be produced with tools having flat crests and roots; and (3) can be checked with threaded plug and ring gages having flat crests. The standard covers coarse and fine threads, straight pipe threads, and special threads.

THE EDITOR'S PAGES

MARK TWAIN ON THE WEATHER

"There is a sumptuous variety about New England weather that compels the stranger's admiration —and regret. In the spring I have counted 136 different kinds of weather inside of 24 hours."— MARK TWAIN, December 22, 1876.

* * *

"Everybody talks about the weather, but nobody does anything about it." — CHARLES DUDLEY WARNER, who was a great friend of Mark Twain (but often attributed to Mark).

* * *

"I guess it's no use; they still believe Mark Twain said it, despite all my assurances that it was Warner."—CHARLES HOPKINS CLARK, editor of the Hartford, Conn., Courant.

* * *

[Thanks to V. L. Sherman for the above three quotations, the second of which is generally attributed to Mark Twain and is used perhaps too often by writers on air conditioning. — THE EDITOR.]

DOW ASKS WPB TO DROP MAGNESIUM CONTROLS

Following the line of his recent request to Donald M. Nelson that the WPB remove all of its controls from magnesium, because they were no longer necessary for war purposes, Dr. Willard H. Dow last month told the stockholders of the Dow Chemical Co. at the 47th annual meeting that "when the war is over, the need for regulations will cease, and even before the war is finished, we should drop such regulations as are no longer necessary for war purposes, for their continuance only delays our transition into the peace. There may be a shock in suddenly dropping the war controls, but not until every control is removed can we have the free, open, and competitive market in which the customer rules."

THE EDITOR'S PAGES

BACKLOG OF CONSTRUCTION EXCEEDS $10½ BILLION

The backlog of construction projects awaiting the relaxation of government controls and the availability of manpower and building materials exceeds $10½ billion, F. W. Dodge Corp. has reported. The figure covers all states east of the Rocky Mountains and pertains to projects reported up to August 31.

School and college buildings, hospital buildings, manufacturing, loft and office buildings and churches—in the order listed—are the principal nonresidential classifications reported. The backlog of school and college buildings alone amounts to $767,930,000, and all nonresidential building to $2,676,373,000.

In the residential field, Dodge reported a backlog of slightly less than a half billion dollars for one-family dwellings to be built for owners to order and by operative builders for sale or rent. The total of residential building, including apartment houses, dormitories and hotels, is $1,032,066,000.

GOODMAN APPOINTED PROFESSOR AT ILLINOIS TECH

William Goodman, consulting engineer for the Trane Co., and a member of HPAC's board of consulting and contributing editors, has been appointed research professor of refrigeration and air conditioning at Illinois Institute of Technology, it was announced last month by President Henry T. Heald. Mr. Goodman will begin his new duties in Chicago, where he will henceforth make his home, on November 1 with the opening of the new term in Illinois Tech's round-the-calendar schedule. His is one of a series of appointments being made by Illinois Tech as a part of its postwar development program.

Mr. Goodman brings to his new work a background of 20 years of practical experience in the fields of air conditioning, refrigeration, heating and ventilating, and other mechanical equipment for buildings. Prior to his recent 10-year connection with Trane, Mr. Goodman was a consulting engineer in Chicago. He handled the design and supervised the installation of the complete mechanical and electrical equipment for a number of large building projects.

Mr. Goodman is well known for his research work and his many published papers in the field of air conditioning. Much of his outstanding work has appeared in this magazine. In addition, Mr. Goodman is the author of the book Air Conditioning Analysis, dealing with the basic theory and practice of air conditioning; and of the Trane Manual dealing with applied air conditioning. Air Conditioning Analysis is widely used as a college text and as an engineering reference book.

William Goodman

At Illinois Institute Mr. Goodman will conduct both undergraduate and graduate courses in his field. He will also be available for consulting service for those who wish to take advantage of the background and experience that he brings to his work.

EMPLOYEES GET AWARDS IN POSTWAR PLAN CONTEST

Four thousand, seven hundred and fifty dollars has been given in awards to 15 employee winners in a postwar planning competition conducted by the Lincoln Electric Co. Top winner of the $1000 first prize was Jim Nicholl, foreman of the shipping department, who submitted a paper on a deep drawn, automatically welded steel container for export packing and shipping of electrodes. The new container would replace the present wooden box now being used. His paper showed the general design and method of manufacturing the container, and estimated that the savings in export boxing costs and freight might run well over $25,000 per year.

One hundred and sixty-one papers were submitted in the postwar planning competition for the purpose of gathering all of the ideas of each employee to assist management in planning for the future.

INDOOR CLIMATE INSTITUTE HOLDS OPEN FORUM

After a year and a half of organization work, the Indoor Climate Institute called all interested members of the heating and air conditioning industry to an open forum in Detroit, September 21 and 22. There they invited them to see the opportunities in creating in the public mind a desire for greater comfort through controlled indoor climate—"the 4th dimension of living"—and to join together in a cooperative movement to do the job.

Well over 200 responded. They heard those who have worked to establish the ICI these last 18 months report on the progress of the organization and explain the possibilities of getting a larger share of the shelter dollar for heating and air conditioning through better selling and proper promotion and publicity. They heard them stress the fact that the ICI is not another trade association and not an organization promoting special interests. And, finally, they heard them make it clear that it is squarely up to the industry itself to decide whether it is all a worthwhile objective and one that can be achieved through the kind of cooperative effort that the ICI can lead. If so, they asked for the kind of industry support necessary to carry through the program.

GIVE TO THE COMMUNITY AND WAR FUND!

HOW TO CONSERVE FUEL IS SUBJECT OF WEEKLY LETTERS TO OPERATING MEN

The advisory council for the Chicago area of the national fuel efficiency program, conducted in cooperation with the U. S. Bureau of Mines, is issuing a series of weekly letters on the subject of fuel economy. The letters are written by Joseph Harrington, advisory engineer for the Northern Illinois Coal Corp. on coal and its uses, and a member of the council. W. D. Langtry, Commercial Testing & Engineering Co., is the Chicago area coordinator.

In the first of the letters, Mr. Harrington advises cleaning up the boiler room, for good work can't be done in a dirty shop. "Clean up the boiler room," he continues. "Dispose of that stuff behind the boiler; make sure the place is adequately lighted; repair the stokers or grates wherever needed; seal up cracks around the doors and in the brickwork; see that fire and soot blowing doors fit tightly; that the boiler dampers move easily and can be fastened in any position; that the boiler pumps and valve stems are packed. Take a lighted candle and go over the boiler setting; at every crack or leak the flame will draw in."

Soot blowing is discussed in the second letter. "Remember that every 33 F rise in flue temperature represents 1 per cent of the coal fired," he says. "In eight hours, even with fairly clean combustion, the deposit of soot on the tubes will cause a rise of 50 F and in 24 hours it may cause a rise of 100 F.

"Soot should be blown every six hours. As a matter of record, the observed saving by the use of effective soot blowing is often 3 per cent.

"Soot not only acts as an insulator, but, when wet by steam condensation or leakage, produces an acid which will corrode the heating surface in contact therewith.

"Furnace capacity," says the third letter, "is measured by the amount of coal that can be burned completely with the least amount of air. Both the shape of the furnace and the method of firing affect the capacity.

"When a shovelful of coal is thrown onto a hot fire, there is very rapid liberation of the gaseous part. This gas is a rich combustible which burns in the furnace when the proper temperature and air mixture is present. But if several shovelfuls are thrown on in quick succession, so much gas is produced that it cannot all burn up in the furnace, and the capacity is exceeded. This means smoke and fuel loss.

"Stokers introduce coal with greater uniformity and in smaller amounts per unit of time than the equivalent hand firing, and for this reason stokers will produce smokeless combustion in a furnace that would be overloaded at times of heavy hand firing.

"Obviously, also, the length of flame, which is largely a function of the volatile content, affects furnace capacity. The more gaseous the fuel, the greater must be the size of the furnace. The higher the volatile in the coal, the more gaseous is its character. Mere volume is too frequently considered the whole story. The time element entering into the combustion reaction is essential. Length of flame travel becomes necessary, therefore, in order to provide the required time. This may be provided by a skillful arrangement of arches for which expert advice is desirable.

"Many furnaces are overloaded by asking too much of them, by the use of wrong size coal, or improper methods of firing. When this occurs, two fuel losses follow: First, the escape of the rich unburned gases; and second, the insulation of the heating surfaces by soot. Both should and can be avoided."

Letter No. 4 is devoted to hand firing:

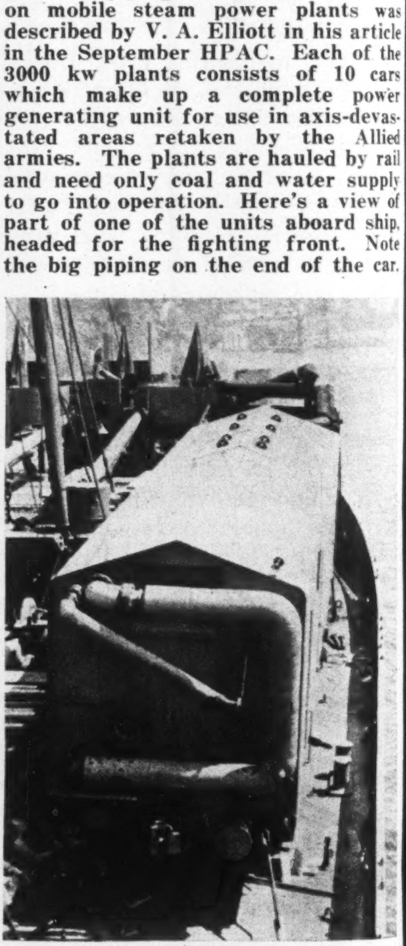
"*Coking Method*—In order to distill off the volatile combustibles slowly so that they can all burn up in the furnace, the coal is piled up on the dead plate just inside the fire door. The heat from the live fire cokes this coal and furnishes the conditions necessary for burning the gases as they slowly leave the pile of coal. After a while, depending on the rate of heat production desired, the pile of coke is pushed back and spread out over the grate. It is now practically smokeless, and the coke burns brightly and makes steam while supplying the temperature to burn the gases from the fresh pile of coal on the dead plate. This system works well in firebox boilers in apartment buildings.

"*Spread Firing, Alternate Method*—In this system the fresh fuel is fired on one side of the grate and then on the other, alternately as often as required. The bright half of the fire furnishes the heat to burn the gases from the fresh fuel on the other side.

"*Spread Firing, Quartering Method*—With heavy loads it sometimes happens that the alternate method does not produce enough mixing effect to burn all the fresh gases. In such cases it is well to fire the back half of one side and the front half of the other side at one firing. Then the next time cover the other two quarters. This tends to reduce the area covered by an unbroken layer of coal and effect a better mixing of the gases with air."

* * * * * * *

How the piping connections are made on mobile steam power plants was described by V. A. Elliott in his article in the September HPAC. Each of the 3000 kw plants consists of 10 cars which make up a complete power generating unit for use in axis-devastated areas retaken by the Allied armies. The plants are hauled by rail and need only coal and water supply to go into operation. Here's a view of part of one of the units aboard ship, headed for the fighting front. Note the big piping on the end of the car.



THE EDITOR'S PAGES

FOURTH DIMENSION OF LIVING?

Although air conditioning was "born" in the early 1900's—and there were some installations even before then that employed certain air conditioning principles—it may be said that the idea of controlled temperature, humidity, air cleanliness, etc., really only began to achieve widespread recognition just before the impact of the national defense program and the war made it necessary to confine the use of air conditioning to essential purposes. However, experience with both process and comfort air conditioning prior to the war production period, and the results achieved during the war in many industries, has very apparently caused a tremendous increase in general interest in the future use of air conditioning.

Several large industrial organizations are now making, or are contemplating, studies of their own air conditioning installations, with the idea of evaluating the advantages of controlling temperature, humidity, and other qualities of indoor atmospheres in connection with their postwar plans. It is important that they know when air conditioning is a "must," when it is desirable but not essential, and when complete air conditioning is not justified—for the job is simplified if provisions for air conditioning are made in the original planning and design. H. C. Hoffmann's article this month (page 615) describes the air conditioning installation for an electronics laboratory, where careful consideration was given to maintaining desired temperatures and humidities both in a large work space area and in a number of smaller rooms. On page 646, an article by T. W. Reynolds discusses the restrictions under which air conditioning installations have been made in wartime, and indicates some of the essential uses.

On page 624 this month is another of the series of articles by William Goodman on design and control of comfort air conditioning systems. There are many methods of achieving a desired result, and the selection of the proper one depends upon the circumstances of the particular case, the objectives, and an engineering analysis of the entire situation. This series of articles presents the methods of accomplishing certain desired results, and the basic principles that govern the applicability of different types of systems and controls, from a refreshingly new viewpoint. Those now designing—and those who will be designing and operating—postwar air conditioning systems are finding this series timely and practical.

Further evidence of the interest in air conditioning is given in the short article on page 623, reporting on a "roundup" of opinion from restaurant operators published last month in American Restaurant Magazine. It is noteworthy that several of the restaurant men who contributed their views mentioned their desires for air conditioning not only for patron comfort, but for the benefit of their employees. Kitchens are hot spots, and "kitchen air conditioning," better ventilation, and more insulation were freely predicted for the future.

Public interest in air conditioning was found, too, in a survey of opinion recently made by the New York Central System, and reported briefly on page 643. The "total vote" and the "male vote" put air conditioning in first place as a desirable feature for postwar railroad coaches. Various surveys of prospective home builders have also given high rank to air conditioning.

Called the "fourth dimension of living" by the ICI, "controlled indoor climate" is—in some processes—pretty close to the "first dimension" or at least the "second dimension." Certainly, it is essential in many factories and many buildings. The wide interest in the production, profit, and comfort and health possibilities of controlling indoor atmospheres is bound to result in careful consideration when the plans for or the modernization of any type of building is up for discussion.

IT'S ALWAYS GOOD BUSINESS

It has been pointed out in these pages before that fuel conservation—a patriotic duty in wartime—is always good business. Because of the government's warnings about the coal situation this winter, we devote our front cover this month—as we have in the past—to that idea, and on page 620 O. V. Sprague describes briefly the fuel conservation organization and method of attack at Eastman Kodak's big Kodak Park works—where the campaign is given the major credit for a 1.6 per cent decrease in coal consumption despite a 5.6 per cent increase in overall plant production.

Earle Shultz, in a recent report before the National Association of Building Owners and Managers, suggested that a feasible means for saving heating steam in office buildings is to reduce the daily hours of heating rather than to try to reduce inside temperatures throughout the day. Excerpts from his report, with data showing the results in two buildings which operated on this method last year, are given in the article on page 622.

You probably know that the Bureau of Mines is sponsoring a national fuel efficiency program—a

GOOD DEAL

6th
WAR
LOAN

voluntary effort. You may not know just how this campaign is organized; if you don't, the short article on page 640 explains the setup. The names and addresses of the local area coordinators who direct this program in their own localities have been published in the July, August, September, and October issues of HPAC.

The demands of war—and the shortages of manpower, transportation, and other "critical materials"—make the elimination of all waste a patriotic duty. Aside from that, however, it is and always will be good business to avoid any unnecessary consumption of fuel. As far as the "cash register" is concerned, waste of heat units is just about as bad as shoveling dollar bills into the furnace.

U. OF I. STUDIES EFFECT OF CLIMATE ON HUMANS

From tests during which 12 volunteer "human guinea pigs" spent 8 hr a day in a temperature of 20 F below zero, the University of Illinois is learning about some of the effects of diet upon human resistance to cold and upon human activities under cold conditions. This knowledge is of special value to high-flying military aviators; it applies also to Army and Navy activities in the Arctic, and to winter outdoor workers in the northern United States, Canada, and Alaska. Purpose of the experiments was to determine the effect upon cold resistance of modifying the proportions of the three food elements—protein, carbohydrate, and fat—in the diet; also included was the effect of meals at shorter intervals.

Meals high in carbohydrates—starches and sugars—or in fats were found to be valuable in reducing the decrease in both internal and surface body temperatures, and in reducing the effect of the cold upon the coordination of nerves and muscles. Eating three small meals at 2 hr intervals during an 8 hr period of exposure to the intense cold instead of one larger meal in the middle of the period was found to increase the benefit of the diets.

Conducting the tests were Dr. R. W. Keeton of the university's college of medicine and Prof. H. H. Mitchell of the college of agriculture. Prof. M. K. Fahnestock of the college of engineering planned and supervised the apparatus. The research was done in the educational and research hospital of the university's college of medicine at the Illinois medical center on Chicago's near west side. The project was carried on with the cooperation of the committee on medical research of the U. S. Office of Scientific Research and Development.

The 20 below zero temperature was maintained in an air conditioned, cork insulated room 14 ft long, 10½ ft wide, and 8½ ft high, furnished with tables and chairs. A double glass window, loud speaker communications, and electrical cable linked research workers and their subjects. By means of thermocouples at 17 points on each subject's body, from forehead to left big toe, body temperatures were kept under constant observation.

The research is part of an intensive study of diet and climate and its effect on humans which is being carried on by the University of Illinois on its campus in Chicago and on the campus at Urbana-Champaign, with the colleges of medicine, agriculture, engineering, and liberal arts and sciences cooperating.

HOW TO INCREASE WAGES AND DECREASE COSTS

Formally launching magnesium as the "great metal of the world to come after the peace," Dr. Willard H. Dow, president of the Dow Chemical Co., last month told the first meeting ever held of the producers and fabricators of the metal that "magnesium holds within itself a greater power to increase wages while at the same time decreasing costs than do all the laws and all the politicians on earth. For real wages, let me remind you, can never be more than temporarily increased by law. They can be increased only by science."

The occasion was the initial luncheon of the Magnesium Association, which has recently been formed to advance the interests of the new industry and to bring this metal to the attention of the public.

URGES REVISION OF EXPORT COMMODITY SCHEDULE

Chief topic of discussion at a meeting of the foreign trade committee of the Air Conditioning and Refrigerating Machinery Association held recently was the need for revision of the commodity classifications for refrigeration and air conditioning equipment, as covered in schedule B of the statistical classification of domestic and foreign commodities exported from the United States. Pointing out that the present commodity classifications are very confusing, the committee is urging that the Bureau of the Census revise the classifications before issuing the 1945 edition of the schedule.

? Which of the articles published this month most interests you? On what subject would you like to see more articles? The editors would like to know, as it will be helpful in developing material for future publication, will aid them in planning HPAC to meet your every-day needs and interests. Your cooperation in filling in and returning the coupon will be appreciated.

The Editors,
Heating, Piping & Air Conditioning,
Six North Michigan Avenue,
Chicago 2, Illinois.

The following article in the November 1944 HPAC most interests me:

....

....

I would like to see more articles on the subject of:

....

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Name.. **Title**..........................

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....

THE EDITOR'S PAGES

AIR CONDITIONING A VITAL PRODUCTION TOOL

A "wildcat" strike of crane operators—key production men—in a large steel plant last month was caused by dissatisfaction over relief operators assigned for certain periods when crane cab temperatures rise, according to newspaper reports. A few weeks previously, a strike in a small radio parts manufacturing plant in a nearby city was caused by dust conditions that the employees felt could be corrected.

The very real importance of proper atmospheric conditions in industry is thus demonstrated, no matter whether management or labor was right in either or both of these affairs. Air conditioning is truly a vital production tool.

WARNS OF APATHY IN 6TH WAR LOAN

"The 6th war loan will be the toughest one we have faced," declared Ted R. Gamble, national director of the Treasury's war finance division, in a recent appeal to business men for advertising and publicity support. "We will have to fight a spirit of 'over-optimism' on the part of many who will point to our achievements in Europe and forget the all-out battle we must fight with Japan. Our war in the Pacific must be paid for in dollars—war bond dollars," Mr. Gamble said.

Addressing an appeal directly to business organizations, Mr. Gamble said, "The Treasury will very greatly appreciate your advertising and publicizing to the fullest possible extent the urgent necessity of purchasing war bonds to the limit of each individual's capacity."

DON'T MISS THIS SERIES OF ARTICLES

The tenth installment of the series of articles on Design and Control of Year 'Round Comfort Air Conditioning Systems, by William Goodman, is published in this month's issue of HPAC. Two or three more installments will complete this valuable treatment of this important "postwar planning" subject. This month's article is devoted to controlling the dew point temperature of the air supply in the wintertime.

It's probably safe to say that no one can become an expert in anything just by reading a series of articles—or even a book—on the subject. The current Goodman series, however, can do much to *help* engineers and contractors to become experts on comfort air conditioning, for the basic principles that govern design and control are carefully organized and thoroughly discussed. If you've missed some of the previous installments, don't let that keep you from starting the articles this month. Each is pretty much independent of preceding installments.

And don't let anyone tell you they're hard to read—they're not, honest. Mathematics and equations are conspicuous by their absence, and simplified diagrams and skeleton charts make the discussion easy to follow.

The only reason we thought we'd mention all this is that we don't want anyone who would benefit from the information given in these fine articles to miss them. A word—more or less—to the wise is sufficient.

LOCAL A C COUNCIL JOINS WITH ICI

The Air Conditioning Council of Western New York, Buffalo, N. Y., according to an announcement by W. E. Voisinet, president, has become the first local chapter of Indoor Climate Institute, and the name of the local organization has been changed to Indoor Climate Institute, Western New York Chapter.

The council has been operating for eight years and has pioneered much of the same work that is being done by the ICI. "Our members voted to join forces with the national ICI in order to reinforce and broaden our public information and training programs," Mr. Voisinet said.

P. B. Zimmerman, vice-president of Chrysler Corp.'s Airtemp Div., is president of the Indoor Climate Institute.

CENTRAL REFRIGERATING PLANTS HAVE ADVANTAGES FOR "DISTRICT AIR CONDITIONING" OF BUILDINGS

In an article published in the Bulletin of the National District Heating Association, A. C. Buensod and R. W. Waterfill, of Buensod-Stacey, Inc., cite advantages of central refrigerating plants for supplying a cooling medium circulated to several buildings for air conditioning. These advantages include eliminating from the building itself the power requirements for the refrigeration cycle of the air conditioning system, eliminating from the building the requirements for carrying away the heat (which usually means city water or a cooling tower), and the ability to employ operating engineers especially trained to operate and maintain the refrigeration plant properly.

It is quite obvious, the authors conclude, "that where a central refrigerating plant can be located adjacent to a river, the large condenser water requirements of the refrigerating equipment can be supplied from that source and usually the land values are much cheaper at the water front. It is also obvious that the utilities now supplying steam for heating service would be in an enviable position of utilizing their boiler capacity for steam turbine drive on large centrifugal water chilling or brine chilling machines. This summer load is recognized by utility men as being valuable in equalizing the load throughout the year.

"The utilization of central refrigerating plants for cities would not, in the writers' opinion, interfere at all with the art of applying air conditioning to any building or space because the main problem involved is the distribution of air and the resultant conditions of comfort to which people would be subjected. The question of using a cooling medium is always incidental and only important when the outside weather conditions require temperature and humidity reduction in the summertime."

FOR DETECTING LEAKS IN PIPE LINES

In a recently issued patent for a method of detecting leaks in pipe lines, a slug of radio-active material is circulated through the pipe, then flushed out from inside the pipe, and the radio-active deposit outside the pipe near the leak is detected by a sensitive Geiger counter.

IBR PLANS FOR POSTWAR HEATING

First steps in a program "to insure the radiator heating industry of a substantial share of the residential heating business" during the postwar period were taken at the recent annual meeting of the Institute of Boiler and Radiator Manufacturers. Members and associate members heard recommendations of committees outlining current activities and a long-range program for the future.

In order to provide wider representation on institute committees, a reorganization, to be effective January 1, was approved. The plan provides for setting up a general engineering committee on which every IBR member will be represented. Working under the supervision of the engineering committee will be boiler technical, radiation technical, research, installation, and boiler rating committees. These committees will absorb and take over the functions of several existing committees. Each committee will have its own chairman and each chairman will report to the engineering committee.

Among the technical and engineering matters discussed were amendments to the IBR code for testing and rating low pressure heating boilers, the recommendations of the Stoker Manufacturers Association regarding firebox dimensions, suggested changes in the convector code, and a proposed boiler construction code.

Much of the discussion centered around the research program at the University of Illinois. A technical manual, known as Installation Guide No. 1, is on the press, it was reported, and will make available to contractors, architects, and engineers the results of research applying to the design and installation of hot water heating systems. Prof. A. P. Kratz told the institute that work had been completed on a University of Illinois bulletin to be entitled Heat Emission and Friction Heads of Hot Water Radiators and Convectors.

THE EDITOR'S PAGES

A. E. Bastedo, vice-president of the Burnham Boiler Corp., was elected chairman of the institute. R. E. Ferry, general manager of the institute, was re-elected treasurer.

ASRE MAKES RESEARCH GRANTS

A program of research sponsored by the American Society of Refrigerating Engineers was launched November 1, when four well-known institutions engaged in refrigeration education and research each received a grant of $500 from the society. Two other universities are to receive similar amounts, already approved by the ASRE council, as soon as details of the projects are completed.

The grants made, on the basis of recommendations of the ASRE committee on education and research, headed by George I. Boone, are for the following projects:

Massachusetts Institute of Technology: Investigation of various calorimeters used in refrigeration test work in order to propose a standard calorimetric procedure for testing of small and moderate sized refrigeration compressors. The research will be conducted under a committee consisting of Professors Jones, Holt, Svenson, and Hesselschwerdt.

Case School of Applied Science: Pressure drop in "Freon" evaporators. The project is under way and will be carried on under the supervision of Prof. G. B. Priester.

Oregon State College: This project is a continuation and refinement of one on which some work has already been done. The object is to determine values of film coefficients of heat transfer from metal surfaces to boiling ammonia in a flooded evaporator. The project will be continued under the supervision of Professor Martin.

University of Texas: Developing methods of preserving fish.

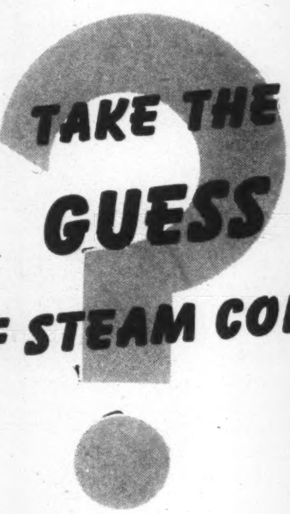
MULTIPLE INDUSTRIAL TENANCY SUGGESTED TO HELP SOLVE POSTWAR WAR PLANTS PROBLEM

Multiple industrial tenancy is suggested as one solution for the postwar war plants problem in a booklet prepared by the Smaller War Plants Corporation, Office of Reconversion. In multiple tenancy industrial plant properties, a manufacturer can rent the type and amount of space he needs and arranges with the management for such services as process steam, hot water, electric power, transportation, car loading, materials handling, etc.

In discussing the suitability of government owned plants for multiple tenancy, it is pointed out that easy access from any part of the floor space to lighting, electric power, water, sewer, and heating steam lines is essential. Access to process steam, compressed air, gas, and hot water from any point is desirable, although not as essential as access to the other services. The ventilating system must be such that subdividing of the floor space will not interfere with its operation.

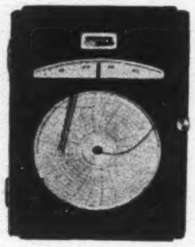
A study of a number of multiple tenancy enterprises disclosed several points representing good general practice. For instance, among the operation considerations that must be given thought is incompatibility between immediate neighbors, which must be carefully guarded against. Difficulties that otherwise might arise include noxious odors or dangers of pollution of one company's product by another company's product or by-product.

All of the enterprises investigated furnish heating steam as a part of the leased facilities and sell metered process steam and hot water to the tenants. Cold water and sewerage ordinarily are arranged for directly by the tenants.



TAKE THE GUESS OUT OF STEAM CONTROL

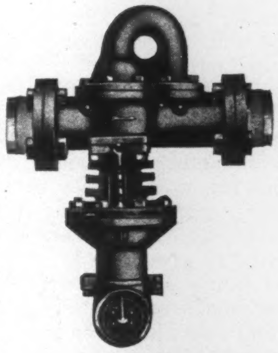
BUILDERS Flo-watch METER



An accurate, durable, wide range flow meter for RECORDING, INDICATING and TOTALIZING the flow of steam. Recommended for steam control purposes where an hour by hour chart record of steam production, distribution or consumption is desired. Builders Flo-Watch is designed and priced for general industrial and power plant application. Write for Bulletin 318-A.

BUILDERS Shunt METER

An accurate, dependable flow meter with totalizer only. Extensively used by industrial concerns and public utilities for metering steam, air and gas distribution. Builders Shunt Meter reads directly in pounds of steam, bolts into the line like a valve or fitting, uses no mercury, has no clock to wind, and requires no power supply. Write for Bulletin 307.



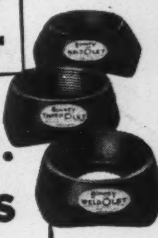
ADDRESS BUILDERS - PROVIDENCE, INC.
41 Codding St., Providence 1, Rhode Island

Sincerely Yours,

BUILDERS-PROVIDENCE

Make Good Piping Better with WELDOLETS · THREDOLETS

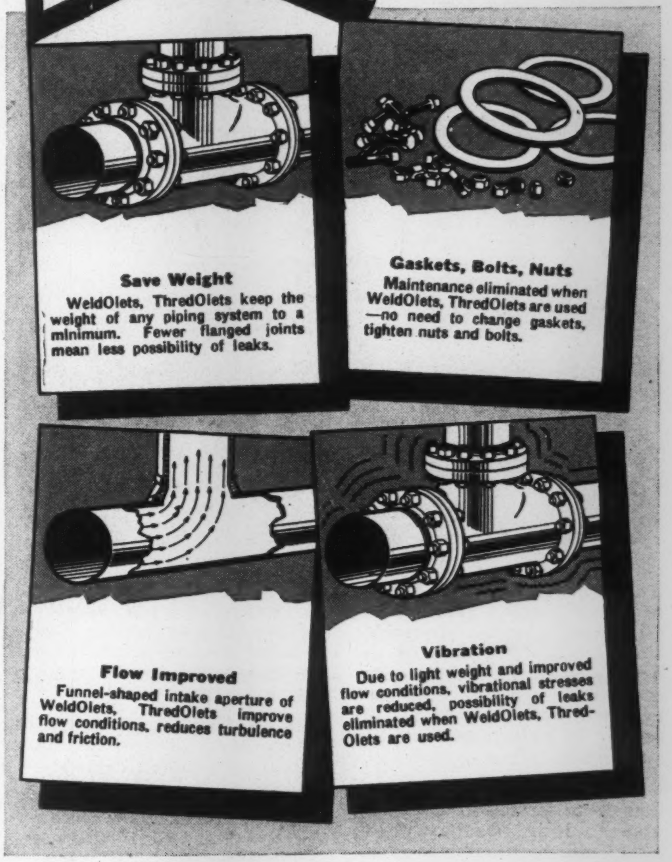
3 Types Meet Every Need



WeldOlets for butt welded branch connections.

ThredOlets for screwed branch connections.

Socket-End WeldOlets for socket-type welded branch connections.



Save Weight
WeldOlets, ThredOlets keep the weight of any piping system to a minimum. Fewer flanged joints mean less possibility of leaks.

Gaskets, Bolts, Nuts
Maintenance eliminated when WeldOlets, ThredOlets are used—no need to change gaskets, tighten nuts and bolts.

Flow Improved
Funnel-shaped intake aperture of WeldOlets, ThredOlets improve flow conditions, reduces turbulence and friction.

Vibration
Due to light weight and improved flow conditions, vibrational stresses are reduced, possibility of leaks eliminated when WeldOlets, ThredOlets are used.

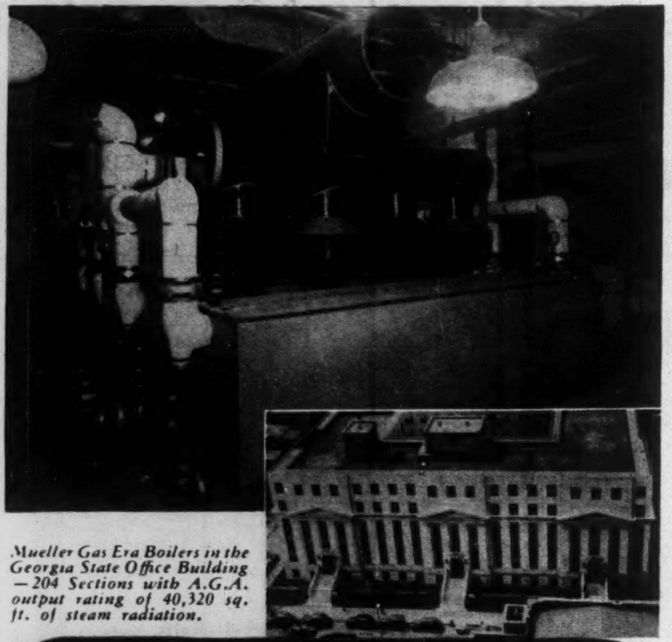
WeldOlets, ThredOlets and Socket-End WeldOlets are suitable for all commonly used pressures and temperatures in every type of piping system. They are installed either before or after erection of the main line—and always with ease and economy. They are equally well adapted to pre-fabricated or "on-the-job" assemblies. Stocked for all standard pipe sizes up to 12" in size-to-size and reducing sizes—and can be supplied on special order for pipe up to 24". Stock fittings are drop forged steel, but to meet special conditions will be supplied in Monel, Everdur, Toncan Iron, wrought iron, etc.

Bulletin WT31 gives detailed information about all the advantages of WeldOlets, ThredOlets and Socket-End WeldOlets. Write for your copy today.

Forged Fittings Division
BONNEY FORGE & TOOL WORKS
ALLENTOWN, PA.

ARMY E NAVY
Star Awarded July 10, 1943

WELDOLETS· THREDOLETS
Welded Outlets for Every Piping System



Mueller Gas Era Boilers in the Georgia State Office Building — 204 Sections with A.G.A. output rating of 40,320 sq. ft. of steam radiation.

MUELLER

If it's steam or hot water, it pays to select Mueller Gas Boilers (illustrated above)—recognized since the earliest days of gas heating as among the leaders in their field. All-cast-iron, gas-designed, backed up by a half-century of boiler manufacturing experience.

Economy of operation, freedom from service troubles, and assured long life have been established by thousands of satisfied users. Easily cleaned, ground iron-to-iron joints, simple non-mechanical burner, complete automatic controls. For steam, hot water, or vapor; direct or indirect hot water supply. Easily installed; castings assembled and pressure-tested at the factory, assuring perfect fit.

If it's forced air, it pays to select Mueller gas-fired unit heaters (illustrated below).

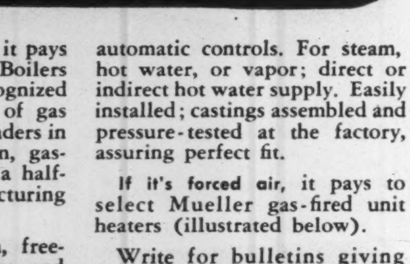
Write for bulletins giving complete information. Place orders now for delivery when regulations permit.

L. J. Mueller Furnace Co.
2007 W. Oklahoma Ave. Milwaukee 7, Wis.
E-7

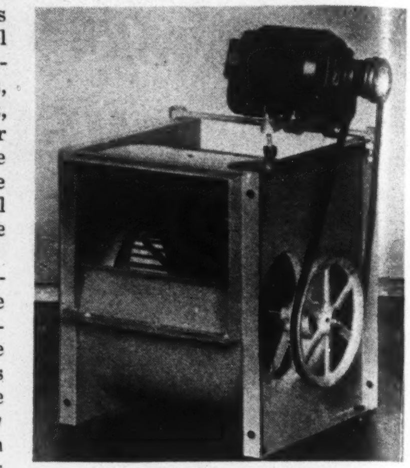
for space heating
MUELLER
Gas-fired Unit Heaters

Shipped assembled, quickly installed. Wide range of sizes. Units for small commercial establishments and industrial buildings. Widely used for heating, ventilating, and processing installations.

MUELLER *Milwaukee*
GAS-FIRED BOILERS AND UNIT HEATERS



Interchangeable Blower Line

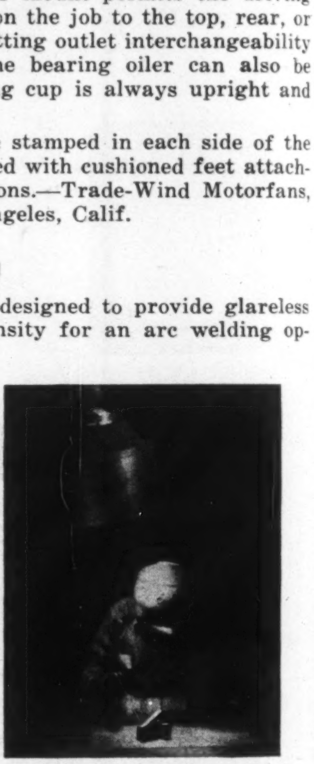


No. 2543—A new and complete line of "Quad" four-way interchangeable blowers is the culmination of five years of pioneering and incorporates such features as unit welded steel construction, streamlined inlet fittings, handy motor mount, balanced blower wheel, and adjustable bearing oiler, says the manufacturer. Wheel diameter sizes range from 6 to 25 in.

A new style of blower housing acts as the frame and is unusually rugged and weave free, it is stated; this is accomplished by the welding of a heavy scroll sheet between two end plates, thus forming a beam inside of which the balanced blower wheel is installed. The blower may be driven from either right or left and a new type motor mount permits the driving motor to be quickly attached on the job to the top, rear, or front of blower frame—permitting outlet interchangeability to fit varying conditions. The bearing oiler can also be easily moved so that the oiling cup is always upright and is always accessible.

The streamlined inlet is die stamped in each side of the blower. All models are provided with cushioned feet attachable to any of the four positions.—Trade-Wind Motorfans, Inc., 5725 S. Main St., Los Angeles, Calif.

Spotlight for Arc Welding



No. 2544—A new spotlight designed to provide glareless illumination of sufficient intensity for an arc welding operator to see his work distinctly through the dark lens of a welding helmet prior to striking the arc is especially desirable for production line welding in which the establishment of the arc must be made quickly and accurately, such as in the welding of thin materials, light alloy castings, and aircraft parts, says the manufacturer.

Mounted on an upright, telescoping metal standard and set firmly in an 18½ in. diameter, 30 lb cast iron base for stability, the spotlight consists of three 300 watt reflector spot lamps surrounded by a circular shade. Rated to give 1000 hr of continuous operation at 120 volts, the lamps are mounted in adjustable porcelain holders so that the area covered by the light beam can be increased from a single, sharp spot 7 in. in diameter to a clover leaf shaped pattern approximately 17 in. across at its widest point.—General Electric Co., 1 River Rd., Schenectady, N. Y.

Marine Type Rotary Pump

No. 2545—Specifications covering the design and operation of a new marine type rotary pumping unit with a built-in relief valve, for handling Navy lube oil, were recently released. This unit, which operates on the "bucket design" (swinging vane principle), has a capacity of 50 gpm at a discharge pressure of 20 psi and is direct connected by means of a flexible coupling to a 3 hp motor

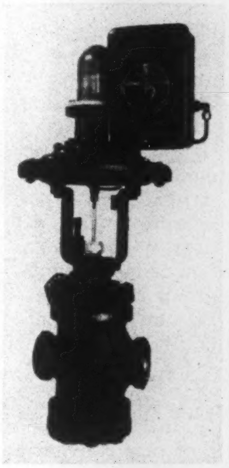
hich drives the pump at 870 rpm. The bearings are in-
rnal antifriction type; a split gland is used for ease in
packing.

To conserve deck space, a rather unique method of
ounting is used. The motor is supported by a bracket or
helf" made of welded steel plate and bolted to a bulkhead.
e pump is mounted vertically on the base of the bracket,
rmitting free access for lubrication and adjustments.—
ackmer Pump Co., 1920A Century Ave., S. W., Grand
pids 9, Mich.

ositioner for Pneumatic Valves

No. 2546—New capabilities, convenience, and sturdiness
e featured in a new vernier "Valvactor," a microposi-
ner for pneumatic motor valves. It
used to insure precise and depend-
le valve response, especially where
erating conditions may make the
sponse uncertain, slow, or unsatis-
ctory. It is actuated by air pres-
re changes as slight as the equiva-
t of ½ in. of water and can com-
valve stem movements as small as
1000 in., says the manufacturer.

The new construction involves a
mpletely different arrangement of
e actuating elements. New ease and
nge of adjustment, especially for
plexing and sequencing, and new
ap action, for relay service or
p sequencing of valves or damper
otors, are provided by convenient
o and range adjustments. Ease of
versal is provided, without change
parts or piping.—Foxboro Co., 106
ponset Ave., Foxboro, Mass.



ortable Gasoline Driven Welders

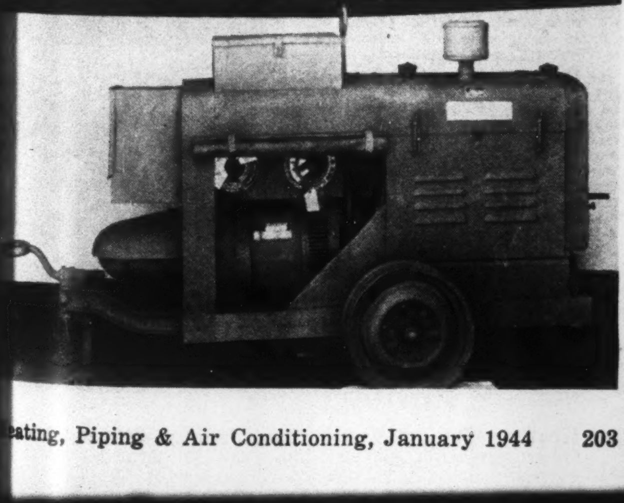
No. 2547—A line of portable gasoline driven welding ma-
ines was announced last month.

The machine shown is made up of a "Waukesha" gaso-
e motor driving a 200 amp "Lincoln Shield Arc" welding
nerator. These units with tool boxes are mounted on a
lded structural shape chassis equipped with rubber tires
d a towing attachment. The power required to move the
achine is such that it can be easily moved by hand. A
ting hook is provided for placing the machine on or re-
ving it from a truck or freight car.

The machine base has an overall length of 72 in. and a
dth of 22½ in. The total weight of the machine is ap-
oximately 1500 lb.

Similar assemblies have been constructed using other
kes of motors and generators. Welding machines with
, 300, or 400 amp capacity generators can be furnished.

These machines are designed for locations where electric
wer is not available and particularly, due to their low
nter of gravity, where the welding work is to be done in
gh terrain.—Libby Welding Co., 2700 E. 15th St., Kan-
City 1, Mo.

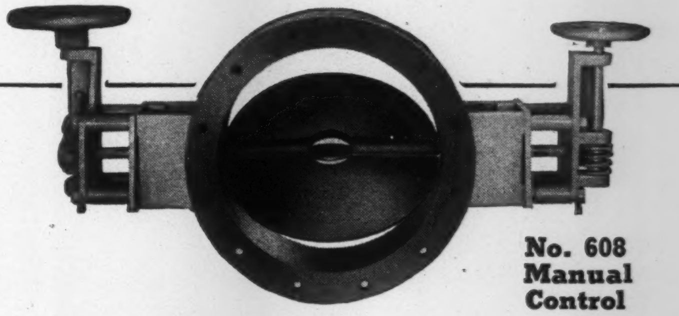


A Single Valve with a DUAL PURPOSE

(PATENT APPLIED FOR)

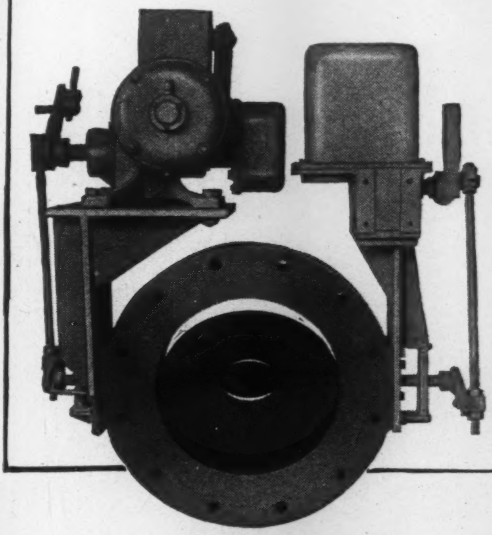
Designed for Either a High Pressure Drop and Small Volume or a Low Pressure Drop and Large Volume

Operates Beyond the Limitations of a Single Valve



No. 608
Manual
Control

Close control of volume and pressure can be obtained with this dual-purpose hand wheel operated R-S Butterfly Valve. The large vane seats against the body of the valve while the smaller vane is free revolving. Both vanes are hand wheel operated. Only four to six revolutions of a hand wheel are required for complete opening or closing.



No. 583
Power
Control

R-S
QUALITY PRODUCTS
SINCE 1908

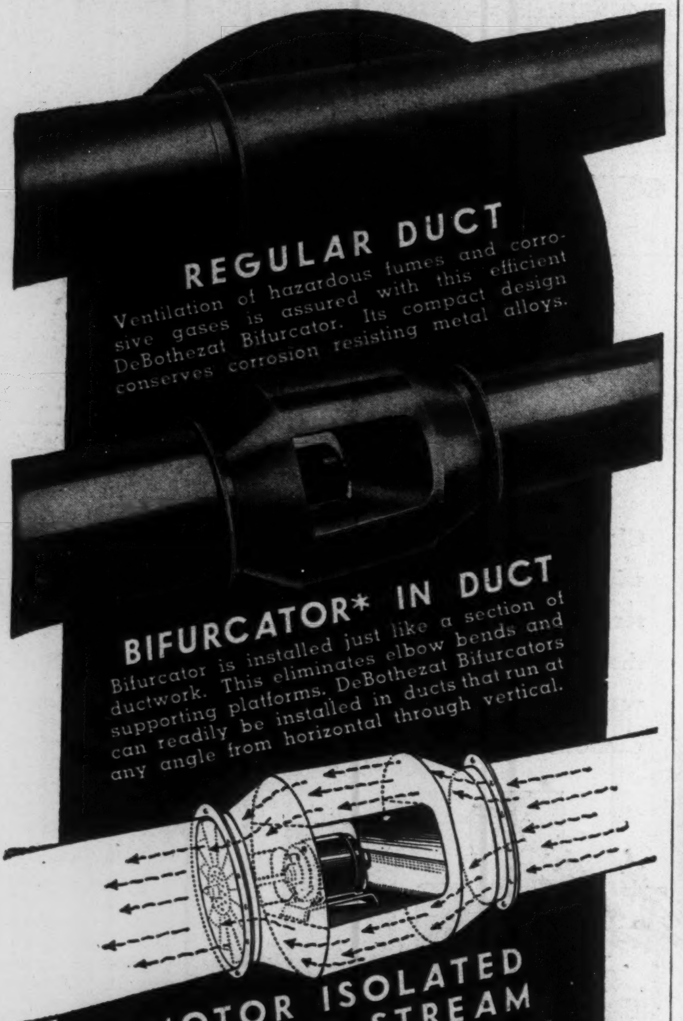
15 to 900 psi

Detailed information and catalog furnished upon request.

VALVE DIVISION
R-S PRODUCTS CORPORATION
132 Berkley Street • Philadelphia 44, Pa.

R-S Streamlined BUTTERFLY VALVES

This
DIFFERENT TYPE
VENTILATING UNIT*
installs *in* the Duct



REGULAR DUCT
Ventilation of hazardous fumes and corrosive gases is assured with this efficient DeBothezat Bifurcator. Its compact design conserves corrosion resisting metal alloys.

BIFURCATOR* IN DUCT
Bifurcator is installed just like a section of ductwork. This eliminates elbow bends and supporting platforms. DeBothezat Bifurcators can readily be installed in ducts that run at any angle from horizontal through vertical.

MOTOR ISOLATED FROM AIR STREAM
Motor is completely isolated from fumes. Air stream is bifurcated or bypassed around the motor chamber which is open to atmosphere at both ends. Motor is protected against burning out by the non-overloading characteristic of DeBothezat's axial-flow fan.

FREE BOOK!
Shows Bifurcator sizes and capacities. Send for your copy.

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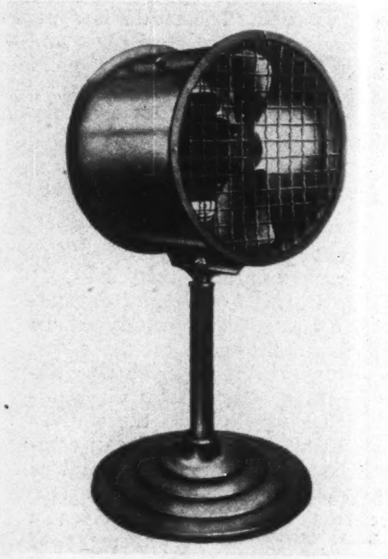
Bifurcators*

DE BOTHEZAT DIVISION of AMERICAN MACHINE AND METALS, INC.
EAST MOLINE, ILLINOIS

Cooling Fan

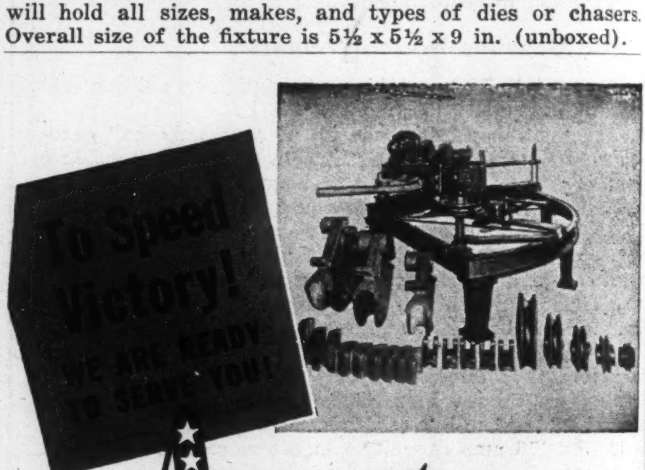
No. 2548—The feature of the new "Air Blaster" fan unit illustrated here is that it delivers a large volume of air in a straight line to the spot where it is needed, reaching effectively into out of the way corners and dead air spaces, says the manufacturer, who states that the discharge expands only slightly and continues as a high velocity air stream over large distances. It is for use in steel mills, foundries, shipholds, forge rooms, meat packing and cold storage plants, freezers, and dairies, and for cooling condensers, ammonia compressors, and transformers.



The unit consists of a heavy gage welded steel housing, mounted on an adjustable pedestal which may be tilted 60 deg up or down.—Chelsea Fan & Blower Co., Inc., 1206 S. Grove St., Irvington, N. J.

New Chaser Grinding Fixture

No. 2549—A new universal chaser grinding fixture recently introduced is designed for easy mounting on the table of any conventional tool and cutter grinding machine and is adjustable for any throat or rake angle desired. It will hold all sizes, makes, and types of dies or chasers. Overall size of the fixture is 5½ x 5½ x 9 in. (unboxed).



"American"
COLD PIPE, CONDUIT and TUBE BENDING MACHINES

Twelve types to select from. Hand operated capacities ¼ to 6" inclusive. Motor operated ¾ to 8" inclusive.

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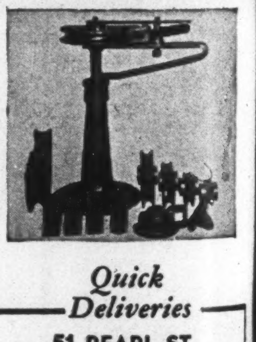

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PIPE BENDING MACHINE
Company INC

Quick
Deliveries
51 PEARL ST.
BOSTON, MASS.

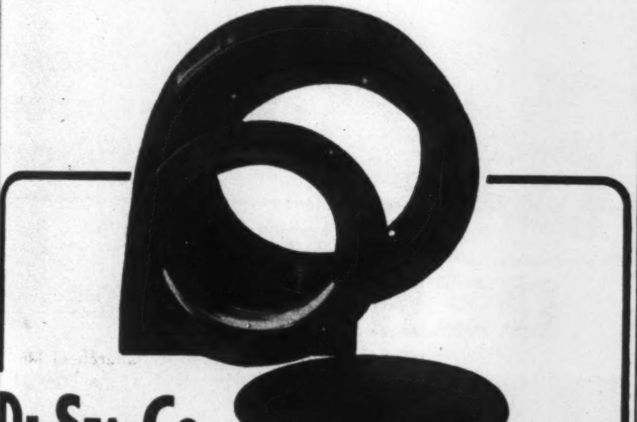
Accurate grinding assured by the new fixture saves costs of replacing dies and chasers which are often ruined either from lack of proper grinding or from too long use between grinds, says the manufacturer. The fixture also eliminates the need for purchasing duplicate sets of chasers where the practice is to return worn chasers to the factory for regrinding.—Oster Mfg. Co., 2057 E. 61st Pl., Cleveland 3, Ohio.

Electronic Level Control

No. 2550—Utilizing electronic principles, a new level control maintains (or keeps within desired limits) the level of any liquid or electrically conducting solid within an open or closed tank, bin, hopper, or other container. It indicates the level by signals or can be installed to operate solenoid or motor driven valves, pumps, lights, bells, or other electrical devices.

The control itself is nonmechanical. It has no moving parts, and has no chemical or other effect on liquids or solids being controlled. It can be installed in evaporators, freezers, boilers, or other containers.

Various combinations of single and double electrode installations are available.—Trimount Instrument Co., 37 W. Van Buren St., Chicago 5, Ill.



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Blower Wheel Housings

of Standard Dimensions

Made in sizes to fit 4½, 5, 6, 7½ and 9 inch wheels and in widths to suit single or double inlet wheels . . . also individual parts for your own assembly.

De-Sta-Co housings are engineered for maximum efficiency and quietness in operation . . . neatly finished. Send for "De-Sta-Co Blower Housings" bulletin; gives complete information, including essential dimensions.

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Established Over 25 Years
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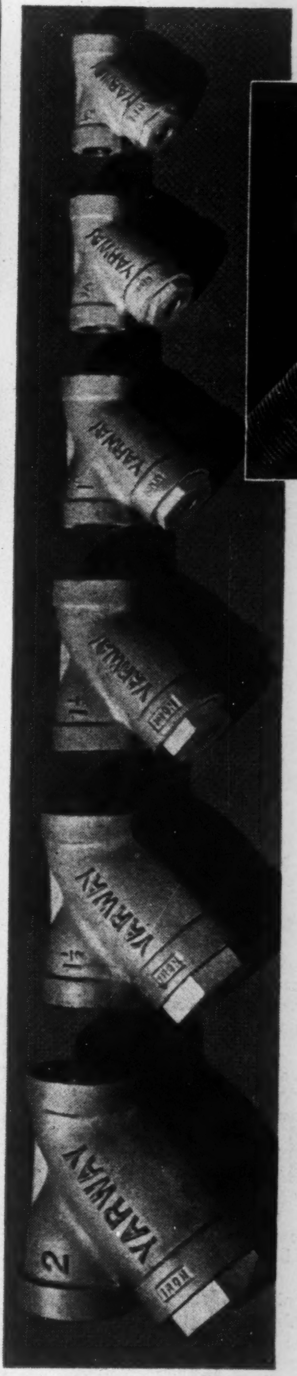
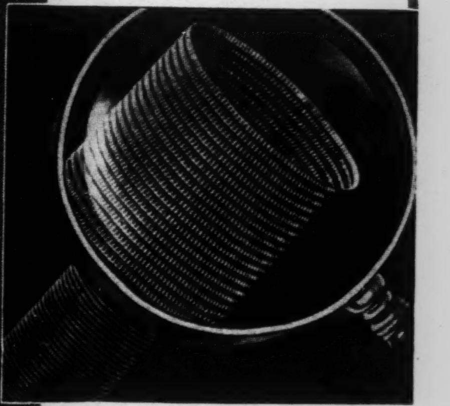
Rust • Scale • Dirt

FROM CLOGGING STEAM EQUIPMENT





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"The Screen's the Thing"

- ***A High Grade Monel Woven Wire Basket*** **with mesh fine enough to catch the dirt — yet ample free area for passage of clean condensate, oil and other fluids.**
- ***Body Cadmium Plated Inside and Out for Protection Against Corrosion.***
- ***Readily Removed Steel Blow-Off Bushing.***
- ***Bushing Automatically Aligns Screen.***
- ***Thousands in Use—Sold by Over 100 Mill Supply Houses.***
- ***6 Sizes ½" to 2" for Pressures up to 600 Lbs.***

See Your Supply House or write for Bulletin S-200

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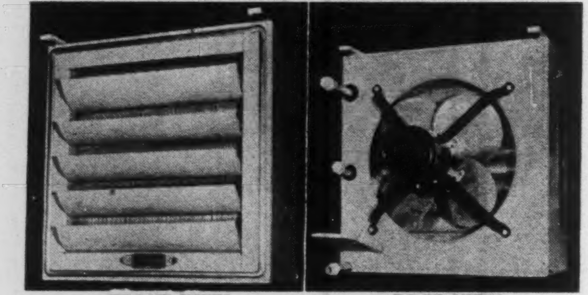
2 Victory ITEMS by KRAMER

DESIGNED to comply with the latest government limitations on critical materials. The number of styles and models has been reduced to facilitate quick delivery.

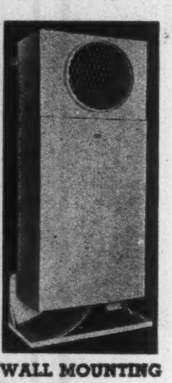
KRAMER *Victory* COOLMASTER



FRONT VIEW BACK VIEW

OUTSTANDING FEATURES: Accurately rated. All ratings based on tests made in accordance with accepted standards and are guaranteed. ● No welded or soldered return bends. ● Can be used with Freon, Methyl, Sulphur, Ammonia, or Brine. ● Heat Interchanger is furnished. ● One man suspension brackets for easier mounting. ● Unusually pleasing in appearance. ● Finished in chrome gray shade of crackle; baked on a bonderized (rustproofed) base. Silent, carefully balanced fans direct connected to totally enclosed motors specially built for fan duty and long life.

KRAMER *Victory* PANEL UNITS



WALL MOUNTING

OUTSTANDING FEATURES: All steel coil, hot galvanized after fabrication. ● Accurately rated. ● All ratings based on tests made in accordance with accepted standards and are guaranteed. ● Heat Interchanger is furnished. ● Carefully balanced fans direct connected to totally enclosed motors built for fan duty and long life. ● Finished in baked chrome grey crackle paint.

DESCRIPTIVE LITERATURE SENT ON REQUEST

KRAMER TRENTON COMPANY
Trenton, New Jersey

WPB . . . OPA . . . PAW . . . Etc.

[Also see pp. 10, 20, 34, *and* 38 *in main editorial section.]*

Procedure Established for Issuing Oil Rations to Late Applicants

The procedure to be followed in issuing fuel oil rations for heat and hot water to "late applicants," those persons who apply after November 30, was announced last month by the Office of Price Administration, with the issuance of amendment 90 to ration order 11.

A special method for figuring and issuing rations to these late applicants was set up because a consumer who applies for a ration after October 1, the beginning of the OPA heating year, does not need as much fuel oil as the consumer who applied earlier.

Under the plan for issuing rations to late applicants, local boards first figure the annual ration and then reduce the amount actually issued by the proportion of cold weather that has passed up to the date of the application.

Because weather conditions are an important factor in computing heat rations, it is not necessary to deduct from the rations for that period before the temperature began to drop materially. For "administrative reasons," it was decided to issue full rations for hot water even though some time has elapsed since the start of the new heating year.

Consumers desiring rations for heat or hot water for domestic uses in private homes apply on form R-1100 (revised) or, if that is not available, on form R-1100. Applicants for ration for premises other than private dwellings use form R-1101 (revised) or R-1101. The householder

A 7-YEAR RECORD *of* ECONOMY SATISFACTION *and* COMFORT

Here is an example of the type of service that wins friends for

GEHL STOKERS

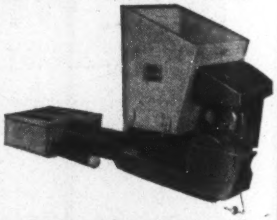
IN 1935 The First Methodist Church of Milwaukee, Wisconsin, installed a Gehl Stoker. In 1936 they wrote:

● ". . . The entire new system has worked to such advantage that we used about one-half the coal previously required . . . "
(The saving quoted for the first year was $365.33.)

IN 1943 The church wrote:

● ". . . the Chairman of our house committee estimates that the Stoker has more than paid for itself. In addition to the economy, it is a very great satisfaction and comfort to all our people."

*Copies of complete letters on request.



Models for factories, warehouses, public buildings, office buildings, apartment buildings, schools and churches.

Write for catalog and our plan of dealer cooperation

GEHL BROS. MFG. CO.
Established 1867 Dept. BL-831 West Bend, Wisconsin

A GEHL WINS FRIENDS WHEREVER IT GOES

applying for a late ration supplies the name of the person who had a ration for that equipment for the last heating year.

CMP 9A Procedure Used for Repair Parts Only

Repairmen are only permitted to use the procedure under CMP regulation No. 9A to obtain repair parts for use in their business and may not use the procedure to obtain complete items of equipment such as a furnace or lathe, the War Production Board pointed out last month. Regulation 9A assigns an AA-3 preference rating to repairmen for use in purchasing repair parts and materials to carry on their repair work.

In clarifying the meaning of the term "repair parts", WPB pointed out that a repairman might purchase parts to repair a furnace such as grates under the procedure, but he may not use it to purchase a complete furnace. This distinction is made in interpretation No. 1 to the regulation.

Some Restrictions on Heating Specialty Manufacture to Be Lifted

Although directives prohibiting the use of brass in the manufacture of radiator valve bodies were not to be withdrawn prior to December 31, 1943, the War Production Board announced December 3 that these directives might not be renewed when they expired. Manufacture of radiator supply valves might thus be resumed within the limits of material available.

Since certain sizes of radiator valves are being manufactured of substitute material and since resumption of the use of brass and consequent manufacture of additional sizes will lessen the demand for the substitute types, manufacturers were cautioned by WPB to avoid excessive production of valves made of substitute material.

Proposed changes in schedule VIII of order L-42, under consideration, would lift some of the restrictions on the manufacture of vapor and vacuum heating specialties,

K-3B

Available in widest range of sizes, from 3/8" to 6" I.P.S.

For operating pressures up to 5 pounds.

Unusually low in current consumption.

For all voltages and frequencies, A.C. or D.C.

Quiet, positive and trouble-free operation.

INDUSTRY'S FIRST CHOICE SINCE '31

General Controls' K-3B is a versatile magnetic gas valve. It has a wide acceptance for use in controlling gas to heat-treating ovens, boilers, furnaces, and similar industrial installations. Write for Catalog 52 for full description specifications.

GENERAL CONTROLS

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ON THE HOME FRONT

Most of the widely used items of Petro Oil Burning Equipment are currently available for replacement and for authorized new installation under W.P.B. regulations and ratings. Where we cannot ship at once, the delay is usually nominal.

Petro equipment includes:

DOMESTIC "CONVERSION" BURNERS
1 to 6 gal. per hour

LARGER "LIGHT (No. 3) OIL" BURNERS
general application type
6 to 18 gal. oil per hour

COMBINATION BURNER-GENERATOR UNITS
both steel and C. I. sectional boilers; forced warm air units; and instantaneous water heaters.

INDUSTRIAL OIL BURNERS
Manual - Semi Auto - and Automatic* for either un-heated or pre-heated industrial oils, up to 145 g.p.h. Built-in motor or belt drive.

****When pre-heated oils are burned the Petro Thermal Viscosity system insures consistent maximum combustion efficiency at all firing stages, automatically and reliably.***

Petro Engineering co-operation is still available. Research-development is active. When your post-war activities start, Petro will be ready for you.

OIL IS AMMUNITION
USE IT WISELY

Full data on Petro Industrial Burners are in our Catalog—see Sweet's or Domestic Engineering Catalog Files—or we will gladly send copies on request.

PETROLEUM HEAT AND POWER COMPANY

Makers of Good Oil Burning Equipment Since 1903

STAMFORD CONNECTICUT

Mortite UTILITY TAPE

HUNDREDS OF USES

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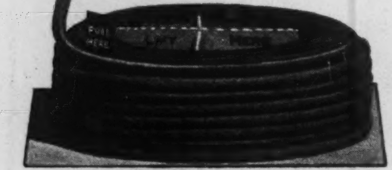
INSULATES • WEATHERSTRIPS PLUGS UP CRACKS • MAKES PACKING OR GASKETS • CAULKS CASEMENTS GLAZES WINDOWS

This new pliable plastic does not crack, chip, dry out or shrink. Easy-to-handle, unrolls like ribbon and is ready for use, inside or outside. Can be painted.

SIMPLE TO APPLY

Mortite adheres to any clean, dry surface. No tacking or tools needed, just press into place and it stays put.

About 80 ft. to a roll. Order through your supply house or $1.25 postpaid. ($1.40 west of Rockies.)



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512 BURCH ST.
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No More Damage from Condensation or Sweating Pipes, Tanks, Walls, Ceilings and Air Ducts

NoDrip A SURE CURE

• This sensational plastic cork coating prevents condensation drip from metal, concrete, brick, wood, plaster or composition surfaces. Permanently protects metal against rust and corrosion, thus prolonging life of pipes, tanks, etc. Forms a moisture-proof, insulation type coating impervious to acid and alkali.

Stucco-like finish requires no maintenance. A gallon covers about 30 feet of ½" pipe. Dries in 24 hours. Comes in 1, 5 and 55 gallon drums.

Immediate Shipment. Order from your Supply House.

FREE NoDrip Circular about Condensation Drip and its Prevention.

APPLY WITH BRUSH, TROWEL OR SPRAY

J. W. MORTELL CO.
Technical Coatings Since 1895
512 BURCH ST. KANKAKEE, ILL.

according to WPB's plumbing and heating division. It was pointed out, however, that manufacturers should not infer from the proposed lifting of some of the restrictions on the use of brass in radiator valve bodies, that the supply of brass foundry products is plentiful. The manufacture of radiator valves will be limited by the amount of brass foundry products that can be obtained under the controlled materials plan for production of this equipment.

Manufacturers wishing to make radiator supply valves should file a CMP-4B application for the controlled materials that he desires to have allotted to him for this purpose for the first quarter of 1944.

Gas Fired Heating Boilers Simplified by L-42 Order

Gas fired, low pressure heating boilers have been brought under the simplification restrictions of schedule III of order L-42, the War Production Board announced December 6.

Under the amendment, fusible plugs, tri-cocks, and metal jackets (except for gas fired burner-boiler units necessary as a functional part of the boiler) are prohibited for low pressure heating boilers fired by solid, liquid, or gas fuel. Previous restrictions of the schedule prohibited the use of these parts on boilers fired by solid or liquid fuel only.

Changes in L-41 and CMP5 Facilitate Processing Equipment Installation

Action to facilitate the installation of processing machinery or equipment, or the relocation of any machinery or equipment within certain plants, if the cost of the installation materials is less than $500, was taken December 9 by the War Production Board. This move was accomplished by issuance of direction 2 to conservation order L-41 and direction 15 to CMP regulation No. 5.

Permission to install processing machinery or equipment or to relocate all kinds of machinery or equipment is limited to factories, plants, and other industrial units having

It's Easy TO SPOT DIRT CLOGGED FILTERS with a HAYS AIR-FILTER GAGE

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HAYS

Of course you know that air-filters must be cleaned or replaced, but when? The Hays Air-Filter Gage tells you exactly when dirt clogged filters are obstructing air flow, impairing operating efficiency, increasing power costs. The gage is easy to install . . . nothing to get out of order. It has been recommended by engineers for nearly half a century. Write 990 Eighth Ave., Michigan City, Ind., for A-F-G. Bulletin and prices.

The HAYS CORPORATION
COMBUSTION INSTRUMENTS AND CONTROL
MICHIGAN CITY, INDIANA, U.S.A.

INDUCTION HEATING FOR WELDING

FOR UNIFORMITY — *SPEED* — DEPENDABILITY

- ★ Prevents cracking when welding
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- ★ Makes faster, safer welds
- ★ Preheat That Weld

. . . and be SURE!

Preheating by the Smith-Dolan Induction Method generates heat uniformly throughout the welding area. This heat is easy to apply exactly where it is wanted. It is controllable within close limits.

This clean-cut, economical method of heating is unsurpassed. It can be applied in regular production, or to existing installations, which are impossible to preheat by any other method. This unique System is offered exclusively by us, together with engineering advice to fit your individual problem.

Electric Arc, Inc.

"ALTERNARC" TRANSFORMER WELDERS
"DUALARC" GENERATOR SETS
"NEWARC" ELECTRODES AND SUPPLIES

152 TO 162 AND 218 JELLIFF AVENUE,
NEWARK 8, NEW JERSEY

NON-METALLIC
SAL-MO SUPPLY DUCT

for PUBLIC BUILDINGS — INDUSTRIAL BUILDINGS, HOMES & HOUSING PROJECTS

Sal-Mo Supply Duct is **SAFE**—Approved and Listed for Safety, Heating and Permanence, by ***UNDERWRITERS' LABORATORIES, INC.*** **COMPACT**—Exclusive folding feature saves space in cars, storage and in transfer to job; saves time in erection. **INSULATING**—Built-in insulation assures years of fuel saving. **LIGHT**—Weighs less than 8 oz. per square foot. **STRONG**—Proved by Mullens Test, over 400 lbs. per square inch. **MOISTURE RESISTANT**—Fabricated entirely with insoluble adhesives, high humidity will not separate the various layers.

Manufactured in 26 standard sizes (areas from 26 square inches to 448 square inches in 4-foot lengths), allowing for all types of installations. It is also furnished in flat sheets containing 11 to 24 square feet which can be easily rolled or scored on the job.

FOR WARM AIR HEATING, VENTILATING AND AIR CONDITIONING SYSTEMS

A Typical Duct Installation in a Large Church Building.

Sal-Mo Asbestos Insulated Supply Duct Was Used Throughout.

SALL MOUNTAIN COMPANY

176 WEST ADAMS STREET • CHICAGO 3 • ILLINOIS

Bulls Eye!

Bush Heat Transfer Equipment has scored a hit, too . . . with the Army, Navy, Air Forces and Merchant Marine on every fighting front the world around. And when Hitler hits the canvas and Hirohito cries "Uncle" we'll keep right on . . . playing a major role in the boom that's bound to follow. We're on our toes . . . ready and waiting to swing our Sunday punch for YOU in the peace-time battle for business. You'll find new markets, new products, new techniques . . . all waiting for the gong. A postal request will bring our latest Bulletin. Address The Bush Manufacturing Company, Hartford, Connecticut . . . 415 Lexington Avenue, New York . . . 549 W. Washington Blvd., Chicago.

PENGUIN PETE

BUSH HEAT TRANSFER PRODUCTS

a productive floor area of 10,000 sq ft or more which do not make products listed on schedule A of L-41.

Under direction 15 to CMP regulation 5, MRO ratings and allotments may be used by persons on schedules 1 and 2 of the regulation to get the installation materials required for these jobs.

The amount spent in construction permitted by direction 2 is not limited to and need not be deducted from the amount allowed for construction under paragraph c of L-41.

Flow Diversion Valves for Milk Exempted from L-272 Restrictions

Flow diversion valves manufactured for use in the pasteurization of milk were exempted from the restrictions of schedule I of limitation order L-272 by the War Production Board December 8 through an amendment to the schedule.

The valves involved are a specialty item. It was not possible to manufacture them in accordance with present specifications of schedule I and at the same time meet the standards required by the U. S. Public Health Service code for such valves, the radio and radar division of WPB said. This code requires that such valves be supplied with union ends in order to facilitate quick and complete dismantling each time the valve is used. Since the valves come in contact with milk, this construction is essential to health and cleanliness, according to WPB.

OPA Revises MPR 236 On Heating Conversion Parts

The Office of Price Administration announced December 21 a major revision of the regulation applying to parts for conversion of oil burning heating equipment to solid fuel, with the issuance of the second revised maximum price regulation No. 236.

Maximum prices previously established on the basis of the weight of the boiler parts used for conversion purposes in the 17 eastern states will be permitted to revert to a

GET THAT AIR OUT OF THERE

With an AUTO-VENT AIR ELIMINATOR

Circulation Troubles?

Why continually fight air pockets or traps in hot or cold circulating lines? You can "get that air out of there" *and keep it out* simply by installing the No. 7 Maid-O'-Mist Automatic Air Vent. This reliable air vent has a self-closing float-controlled valve and is designed especially for circulating pipe lines, concealed radiators, unit heaters, cooling manifolds, tanks, diesel engines, or any other application where air pockets or traps retard the free circulation of liquids.

Now available in bright brass finish.

APPROVED FOR NAVY, MARITIME COMMISSION AND ARMY USE.

MAID-O'-MIST INC.
211 NORTH ABERDEEN STREET
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AUTOMATIC HUMIDIFIERS FOR ALL TYPES OF HEATING SYSTEMS

DISCOMFORT DEFEATS PEAK PRODUCTION

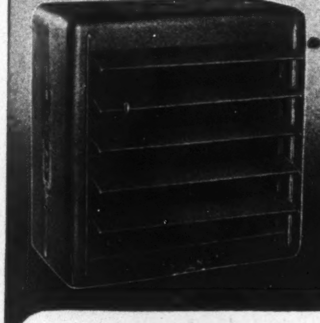
WARM UP *the* COLD SPOTS

WITH YOUNG UNIT HEATERS

TYPE "VS" FOR VERTICAL AIR FLOW

More consideration than ever will be given to the comfort and health of war workers this winter . . . not only to prevent illness that results in absenteeism, but to invite employment, build loyalty and morale, and increase production efficiency. If heating facilities were inadequate last year, if cold spots were detected or if departments have been rearranged, Young Streamaire Unit Heaters can be used to advantage. Their saving of floor space, ease of installation, low first cost, efficient operation and low maintenance cost make Young Unit Heaters desirable for existing or new buildings and additions. Write us direct or consult with the Young representative in your locality, for the solution to heating and air conditioning problems.

YOUNG RADIATOR COMPANY
Dept. 114-A Racine, Wis., U.S.A.



TYPE "SHS" FOR HORIZONTAL AIR DELIVERY

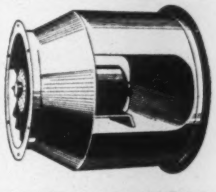
BUY BONDS
PRODUCE MORE
SALVAGE SCRAP
WIN THE WAR

YOUNG

HEAT TRANSFER PRODUCTS

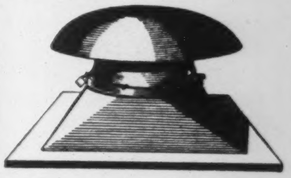
Oil Coolers - Gas, Gasoline, Diesel Engine Cooling Radiators - Intercoolers - Heat Exchangers - Engine Jacket Water Coolers - Unit Heaters - Convectors - Condensers - Evaporators - Air Conditioning Units - Heating Coils - Cooling Coils - and a complete line of Heat Transfer Equipment for aircraft.

4 ANSWERS TO VENTILATING PROBLEMS



1 HEAT AND VAPOR EXHAUST SYSTEMS

DeBothezat Bifurcators *install right in the duct.* For handling corrosive or high temperature fumes and gases. Motor isolated from fumes in chamber open at both ends. Sizes 18 in. to 4 ft.

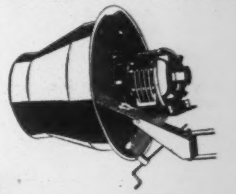


2 ROOF VENTILATORS

Assure positive ventilation *regardless* of temperature, humidity and wind velocity. Hinged top gives easy access to motor, fan and shutter. Light-proof; ready for blackout. Sizes: 21", 27", 36".

3 GENERAL EXHAUST SYSTEMS

DeBothezat offers a complete series of volume and pressure, axial-flow fans. Non-overloading power characteristic. Guaranteed performance ratings based on wind tunnel tests. Direct drives. Sizes from 18 in. through 10 ft.



4 FOR BLAST COOLING

"HY-V" Air Jet combines high-efficiency, axial-flow fan with conversion nozzle for blowing a column of air. Arranged for column or floor mounting. "Air Jet" can be pointed in any direction.

Literature on all DeBothezat Ventilating Equipment is available on request.

De Bothezat

VENTILATING EQUIPMENT

Division of American Machine and Metals, Inc.
East Moline, Illinois

"piece" basis. Dollars-and-cents prices originally established for the eastern states for a group of specialty units used solely for conversion purposes will be extended to the remainder of the country. For sales of complete units, or "conversion kits," the revised regulation establishes dollars-and-cents ceiling prices both on an installed and uninstalled basis in all the 48 states and the District of Columbia.

Steel Heat Exchanger Tests Ordered by WPB

The War Production Board issued December 13 schedule 12 of limitation order L-211, as amended, providing that all steel heat exchanger, condenser, evaporator, and similar tubes be hydrostatically or nondestructive tested hereafter.

OPA Revises Regulation on Oil Burner Service Charges

The Office of Price Administration through a revision of its supplementary regulation covering oil burner services made clear to suppliers which of several specified service charges they may use, in revised supplementary service regulation No. 19 to MPR 165.

Oil burner service suppliers generally operate on either an hourly rate or per-call basis. Under the revision, per-call operators whose present rates under the services regulation (MPR 165) are either less or greater than those established by OPA September 23, 1943, in the oil burner service regulation now have the choice of retaining their present per-call rates or converting to an hourly rate basis not to exceed that established in September 1943.

The new action also provides that (1) rates for the first hour may be charged for any portion thereof, even though the actual working time consumed is less than one hour, (2) charges for the second or succeeding hours must be computed on the basis of 15 min periods, rounded out to the nearest 5 cents, and (3) rates established apply to each mechanic or service man employed on the job.

Another provision makes it clear that the new regulation does not apply to suppliers who sell oil burner service under a seasonal or yearly contract or to sellers who first sell or offer to sell services on or after the effective date of this revised regulation.

L-174 Schedule on Manufactured Gas Consumers Revised

Revised designations of industrial and public consumers of manufactured gas who must receive preferential treatment from gas utilities were announced December 22 by the War Production Board, with revision of schedule A to limitation order L-174. Changes in the schedule bring it into substantial accord with the list of preferred users of natural gas now contained in utilities order U-7, and reflect current conditions in war production programs.

Revocation of general directive No. 1 to L-174 also was announced. Elimination of this directive places gas consumers owning any type of standby equipment on an equal footing for purposes of curtailment in cases of gas shortages. Previously, those with coal burning equipment were the first to have gas deliveries reduced in such circumstances.

Minor Price Reductions for Furnaces Announced in OPA Order 188

Minor reductions in maximum prices of warm air furnaces from which certain parts have been omitted by manufacturers in accordance with recent War Production Board limitation orders were announced December 16 by the Office of Price Administration, in an amendment to maximum price regulation No. 188.

These parts, ranging in price from 5 to 60 cents, include such items as auxiliary doors, handles, dampers, and pokers. The reduction in price, when any of these parts are omitted from a complete furnace, applies to shipments by manufacturers.

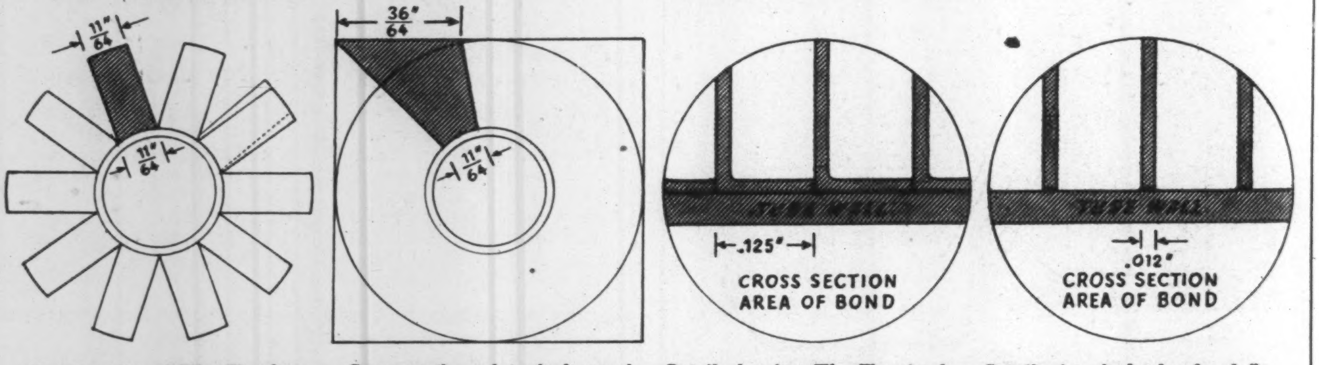
TILCO-FIN

EXTENDED SURFACE TUBING

WHAT FACTORS INFLUENCE THE TRANSFER VALUE OF EXTENDED SURFACE?

Recent authoritative works have completely demonstrated that small uniform segments of extended surface greatly exceed the transfer of solid fins having the same total area.

Because all bonds, metallic or mechanical, resrict heat flow, a bond area proportionately larger than the base area of the fin is essential.



Cross section of Tilco-Fin showing uniform extension of surface. This maintains straight line heat flow, thus assuring consistant fin temperatures from base to tip.

Cross section of typical round or square fin, showing segment with same base area, the disproportionate size of which causes a fanning out and dispersal of heat flow.

Detail showing Tilco-Fin standard construction.

Note that the bond area exceeds the base area of the fin by many times.

Detail of typical edge bond fin construction.

Note that bond area is only equal to the base area of the fin.

TILCO-FIN DESIGN FOLLOWS THE BASIC FACTS OF HEAT TRANSFER

TILCO-FIN INC. 68 SECOND AVE., **BROOKLYN 15, N. Y.**

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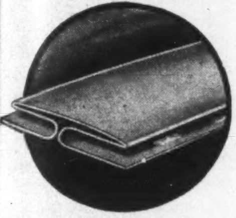

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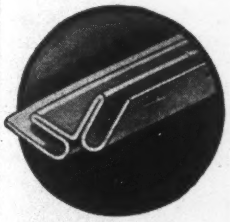

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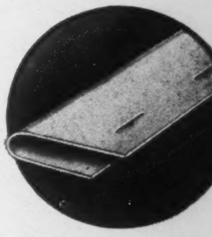

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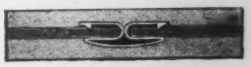

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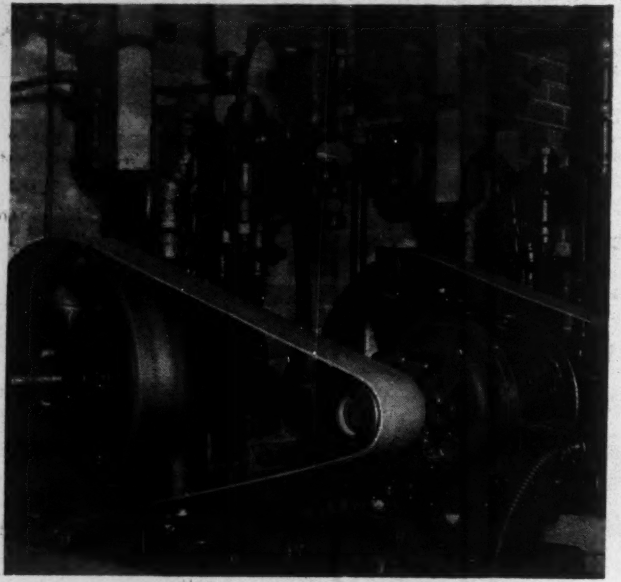

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NEW BOOKS & REPORTS

Conservation of Fuel

The Engineering Experiment Station of the University of Minnesota, Minneapolis, recently issued bulletin No. 20 on the Conservation of Fuel, by Frank B. Rowley, professor and director of the station, and a member of HPAC's board of consulting and contributing editors, Richard C. Jordan, associate professor and assistant director of the station, and Clarence E. Lund, associate professor and assistant director of the station. Comprising 63 pp., 6 x 9 in. in size, single copies are available for 40c, and in lots of 10 or more for 30c each.

The recommendations in this bulletin are the result of extensive research at the station, and have been incorporated by M. F. Blankin, president of the ASHVE, in the society's fuel conservation program [see ASHVE Journal Section, Heating, Piping & Air Conditioning, October 1942]. The savings in fuel provided by insulation, storm windows and storm doors, weatherstripping, and other simple-to-do measures are pointed out clearly in the bulletin. Methods of obtaining the highest efficiency from steam, hot water, and warm air heating systems are itemized. Suggestions pertinent to comfort in spite of restricted fuel supplies include a discussion of domestic hot water tanks, maintenance of correct temperature in a heated structure, combustion efficiency, and other relevant factors.

Piping Stress Calculations Simplified

Piping Stress Calculations Simplified, by S. W. Spielvogel, mechanical engineering dept., Consolidated Edison Co. of New York, consists of some 50 pp. of text of standard 8½ x 11 in. size and 30 pp. of appendices. The author has

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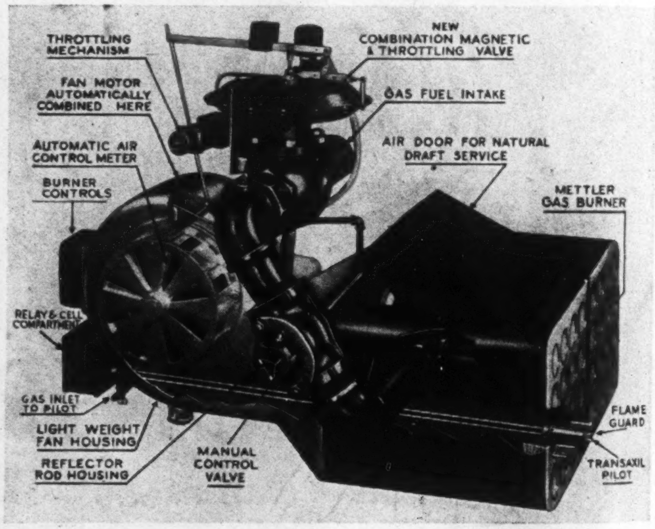
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compressed into this space the essentials of his arithmetical method of computing reacting forces and stresses in piping due to temperature changes. The method makes use of the "force through elastic center" principle utilized graphically by C. T. Mitchell,[1] and applied to particular problems by A. A. Bato.[2, 3] The author's application and development of this elastic center theory are recorded in an ASME paper on Application of the Elastic Point Theory to Piping Stress Calculations, by S. Kameros and the author of this book, Transactions, ASME, May 1935, FSP-57-10. Reference also may be made to his articles in Heating, Piping & Air Conditioning for September and October 1935 on A Simplified Method for Solving Piping Problems, and to Power for January and February 1941 on Stress Calculations for High Temperature Piping.

With this background, it is to be expected that the mechanics of applying the elastic center method have been perfected and that it may be used with assurance that reliable results can be obtained.

The method of presentation is that of a series of examples with a minimum of explanatory material. Arithmetical solutions of 11 typical problems are given which illustrate both the form and method of computation.

While some of the simplicity of presentation is more apparent than real, due to omission of all cross references to tables and curves and absence of source references for expansion data, modulus of elasticity, etc., the author has achieved his purpose of presenting a workable procedure for checking the flexibility of piping layouts.

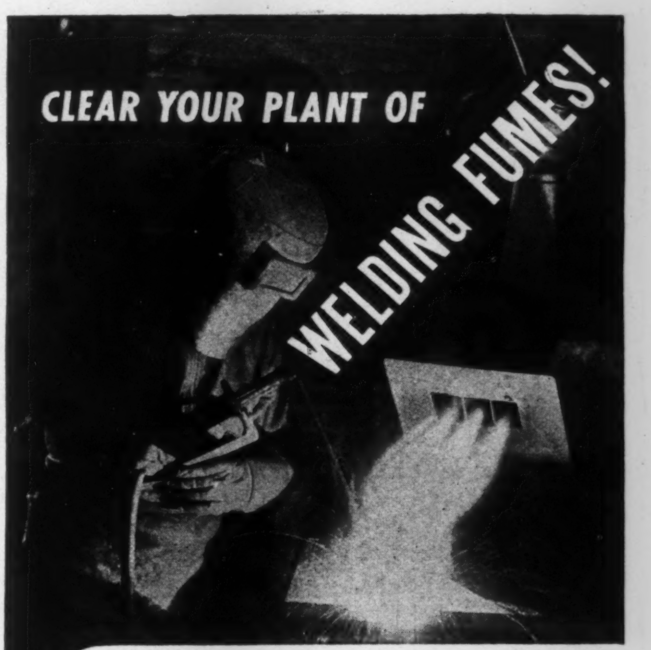
The method given for determining the allowable combined bending and longitudinal pressure stress is in strict agree-

---

[1] A Graphic Method for Determining Expansion Stresses in Pipe Lines, Transactions, ASME, May-August 1930, FSP-52-25, p. 167.

[2] Discussion by A. A. Bato of paper on Stresses and Reactions in Expansion Pipe Bends, by A. M. Wahl, Transactions, ASME, May-August 1928, FSP-50-49, p. 257.

[3] Discussion by A. A. Bato of paper on Frictional Resistance and Flexibility of Seamless-tube Fittings Used in Pipe Welding, by Sabin Crocker and Arthur McCutchan, Transactions, ASME, September-December 1931, FSP-53-17, p. 233.



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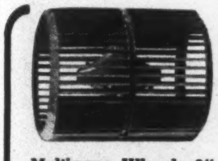

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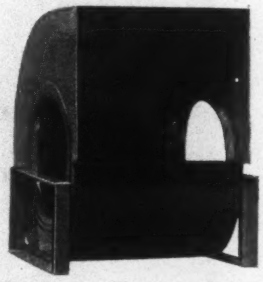

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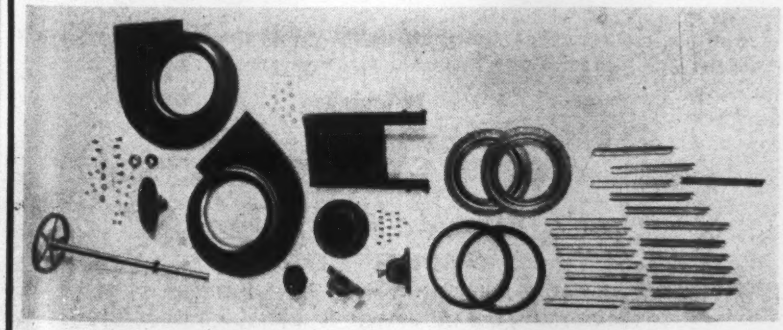

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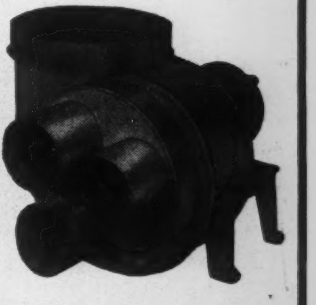

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ment with the rules for power piping systems as given in the Code for Pressure Piping, ASA B 31.1-1942. For other systems, such as oil piping, district heating, and gas and air piping, the code rules permit the use of higher allowable stress values for the room temperature condition corresponding to 100 F or 150 F, depending on the system, rather than the 650 F value. Hence, the allowable combined stress and resulting permissible bending stress determined by the method given in this book are appreciably less than permitted by the Code for Pressure Piping for such piping systems.

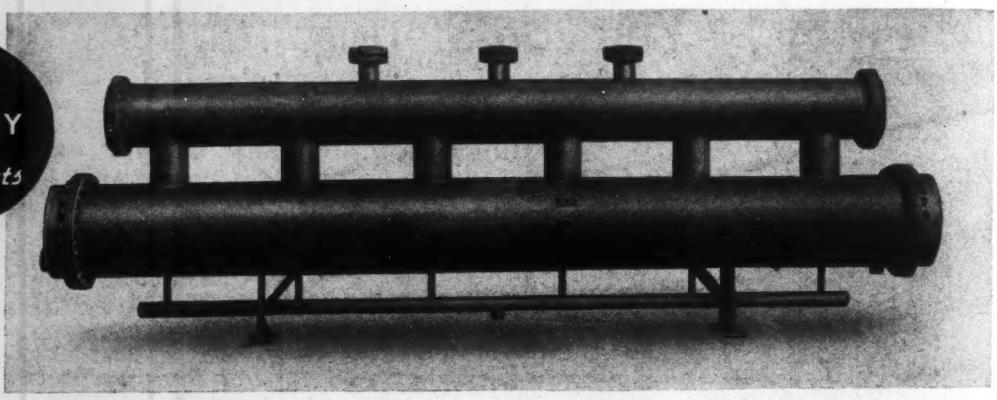
The method used throughout the examples for determining the nominal pipe wall thickness after the minimum thickness has been computed is not exactly correct. In order to provide for the underthickness mill tolerance of 12.5 per cent, it is necessary to add 14.3 per cent to the minimum wall thickness rather than 12.5 per cent. This is the old problem of a 25 per cent raise being different numerically from a 25 per cent cut.

These discrepancies in applying the Code for Pressure Piping rules for determining permissible stresses and nominal pipe thicknesses do not detract from the usefulness of the book in checking bending stresses, but suggest the advantage of referring directly to the Code for Pressure Piping for its requirements.

The price of this volume, which is published by the McGraw-Hill Book Co., 330 W. 42nd St., New York, N. Y., is $2.50—*A. M.*

Marine Ventilation

Marine Sheet Metal Shop Practice, Part I—Ventilation, is a bulletin meant for instruction purposes in training marine sheet metal workers, and its primary value will be found in this field. However, it will also be found useful to designers, engineers, and others dealing with ventilation design but who may not be too familiar with the fabrication possibilities and methods used. While it is written around



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marine practice, there is much that is also applicable to land installations. The main difference lies in the emphasis on heavy ductwork and water, air, and oil-tight sections which are not found in ordinary design.

The bulletin is well written and well organized, and includes numerous illustrations of actual fabricated ductwork fittings, metal working machinery, layout design, and illustrations showing the progressive procedure in making the various fittings and joints, riveting, soldering, spot welding, and flanging.

This inexpensive bulletin, 186 pp. in length, is highly recommended to those interested in this work. It is published by the Department of Public Instruction, Commonwealth of Pennsylvania, Harrisburg, Pa., and is identified as bulletin No. 346.—*J. H. C.*

Marine Piping Handbook

A Marine Piping Handbook for designers, fitters, and operators, and with a glossary of shipyard terms and abbreviations, was published last month. The author is Edward P. Goehring, in charge of piping design at the New York Shipbuilding Corp., who has had 20 years of shipbuilding experience and has taught the subject of his book for some three years.

It has been said that "the modern ship is as dependent on piping as the human body is on blood vessels," and this handbook pioneers in a field which has taken an increasingly important place in the shipbuilding program. There are chapters on pipes, fittings, flanges and supports; valves; main and auxiliary machinery; hull drawings; piping systems; diagrammatic drawings and system calculations; and system drawings, plus sections on tables and miscellaneous information, and shipyard abbreviations and glossary.

This new book comprises 662 pp., 5 x 7¼ in., and has 155 illustrations and 69 tables. The price is $5, and the publisher is the Cornell Maritime Press, 241 W. 23rd St., New York, N. Y.

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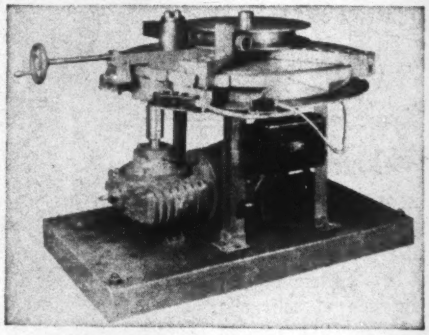

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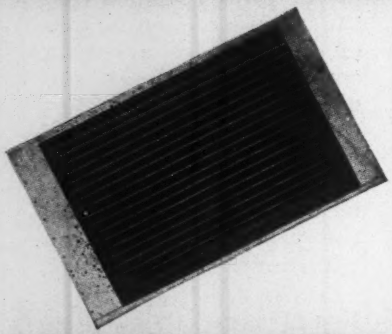

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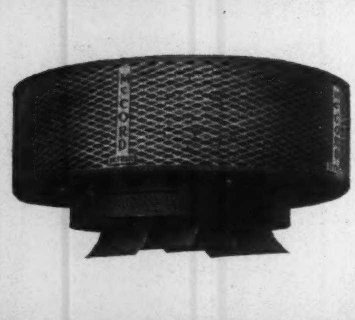

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No. 4604—4 p. bulletin (435) summarizing the performance record of "Copes Flowmatic," a steam flow water level feedwater regulator. Acceptance of the regulator in many industries on various types and sizes of boilers is summarized, and results obtained by users since its introduction some five years ago are discussed.—Northern Equipment Co., 1945 Grove Drive, Erie, Pa.

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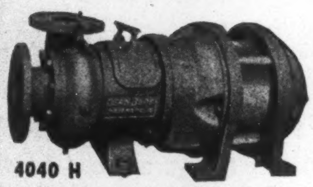

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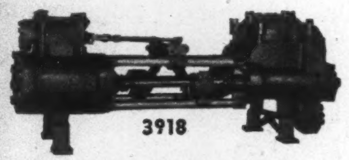

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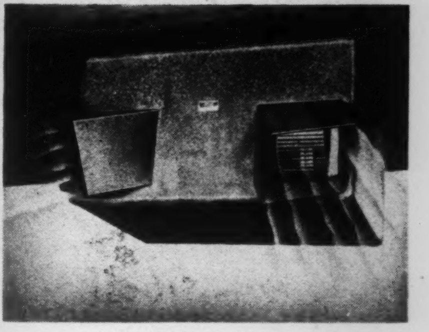
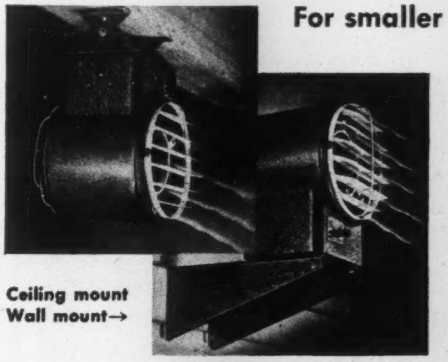
For shop floors and large areas

The two outlets of the Type CUB unit heater distribute warm air over greater space than ordinary unit heaters. Powerful blower drives air through Chromalox air blast heater. The unit is built for ceiling suspension, and the air flow can be directed as required. Thermostatic or manual control. Four sizes—15, 20, 30 and 40 Kw. Blower can be operated alone, without heater, for Summer cooling. A powerful and effective unit for large areas.





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For smaller shop floors

The Type UB heater has wide application. Eight sizes—from 2 to 15 Kw—adapt it to broad range of room sizes. Can be mounted on ceiling or wall, or in portable smaller sizes placed anywhere. Heating unit is Chromalox Koilfin. Blower motor is adequately cooled. On smaller sizes fan can be operated alone for Summer cooling. This unit is extremely valuable for Spring and Fall heating, and as auxiliary heat in extreme cold weather.

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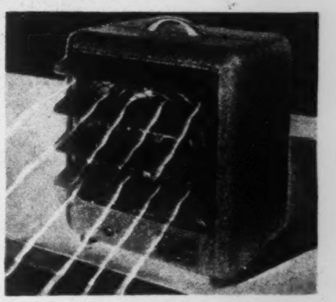

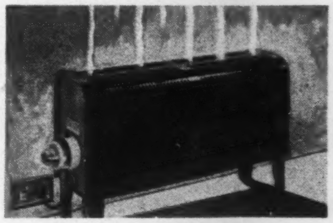

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It is *quick* heat—available any time, independent of boiler operation.

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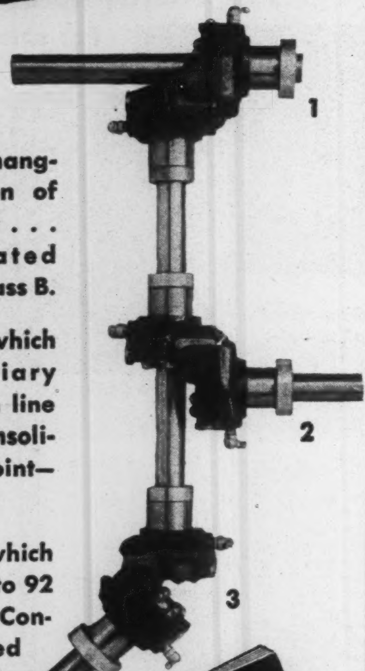
3 A shaft joint which may operate up to 92 degrees . . . the Consolidated Hinged Joint — Class A.



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203 U. S. Nat. Bank Bldg.
PORTLAND, OREGON

tric motors, reduction gears, hydraulic systems, air compressors, spindles, and for high temperatures.—E. F. Houghton & Co., 303 W. Lehigh Ave., Philadelphia 33, Pa.

Metal Products

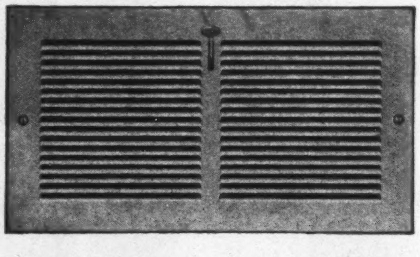
No. 4607—32 p. booklet commemorating the 75th anniversary of the Penn Metal Corp., and the Penn Metal Co., Inc., and "the inventive genius of the founder, Longley Lewis Sagendorph."—Penn Metal Corp. of Penna., Oregon Ave. and Swanson St., Philadelphia, Pa.

Operation and Maintenance

No. 4608—Pocket sized periodical, entitled Operation and Maintenance Review, containing maintenance tips and timely articles on current trends for the shop man and executive. Vol. 1, No. 1, includes articles on motors and drives, lubrication of bearings, mercury arc rectifiers, arc welding, etc.—Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.

Porous Metal

No. 4609—68 p. engineering manual about "Porex" a unique porous metal produced by powder metallurgy, describing the product and illustrating its applications as a medium of filtration, separation, diffusion, flow control, and for other functions. This metal is approximately one-half void and is produced by bonding together, metal to metal, small spheres which are carefully graded, the final product being of "controlled porosity and containing no impurities or other elements." It is made in four grades ranging from coarse to very fine, and comes in various shapes to meet different requirements. Applications are already being used in the automotive, tractor, and refrigeration fields, on diesel engines, oil burners, aircraft engines, pneumatic tools and equipment, instruments and controls, and in the textile and plastic industries. The major portion of the book is devoted



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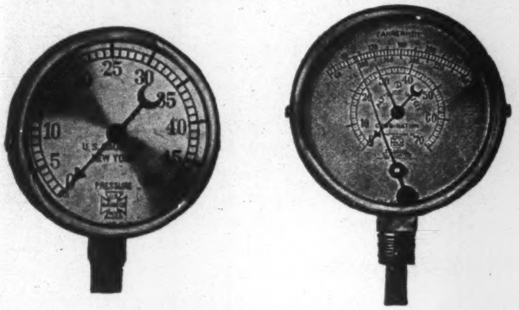

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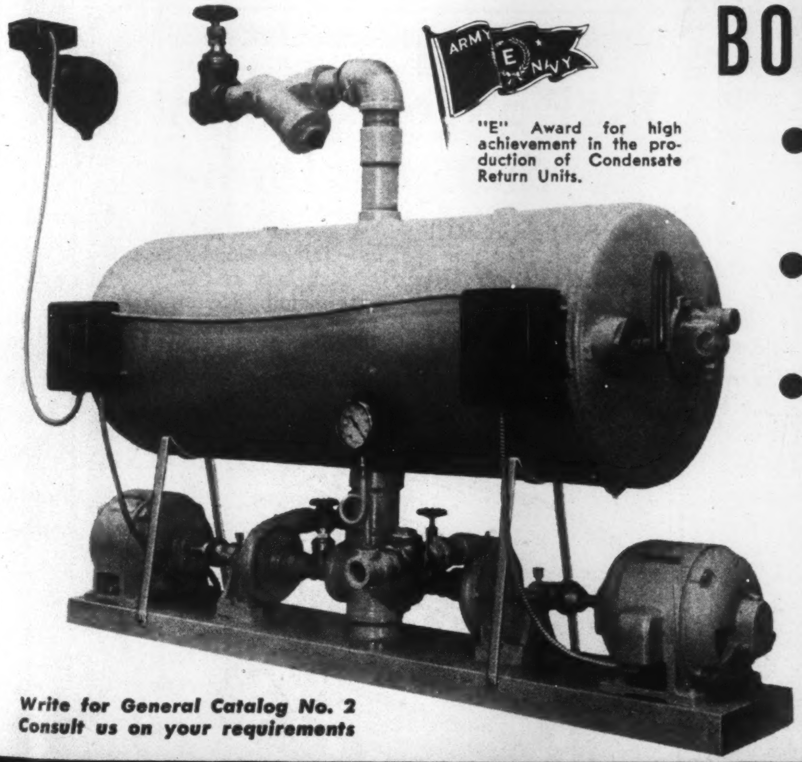

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This is one of the various types of Condensate Return Units manufactured by Walter H. Eagan Co. No matter what your requirements, there is an Eagan Unit to do the job.

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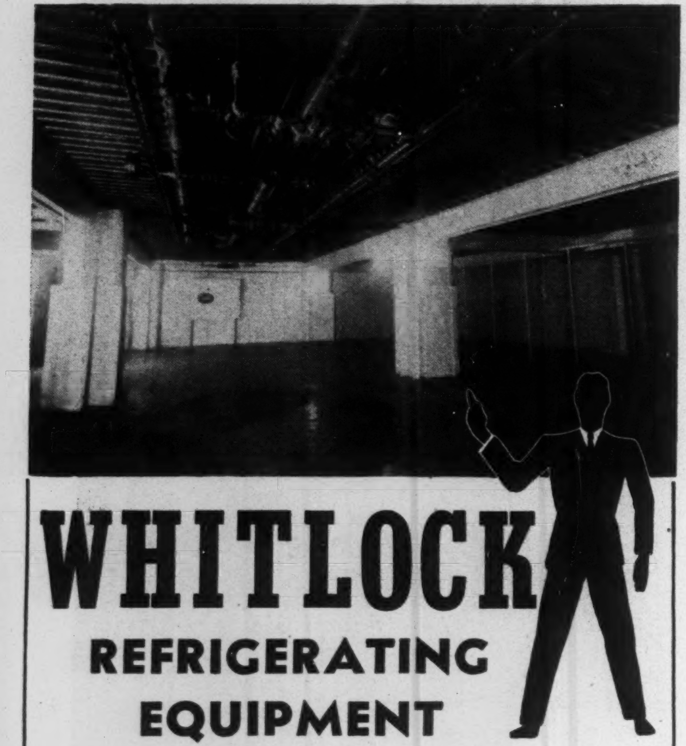

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✓ WHITLOCK ENGINEERS KNOW HOW

The experience of Whitlock engineers, covering a wide range of applications over a period of years, provides the properly designed refrigerant equipment required for your particular needs.

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Whitlock's staff, expert in the design of condensers, receivers, welded headers, prefabricated piping, coils and allied products, combined with Whitlock's extensive fabricating equipment—heat treating furnace for the relief of welding stresses, x-ray machine for examining material soundness—provide the high quality product you demand.

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An adequate supply of medium and heavy steel plate, forged steel pipe, flanges, and steel pipe insures that, with a suitable priority rating, Whitlock can make prompt delivery of prefabricated units.

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Whitlock Equipment (Whitlock-Darling) is manufactured in Canada by Darling Brothers, Ltd., Montreal

to tables, charts, and other engineering data.—General Motors Corp., Moraine Products Div., Dayton, Ohio.

Roof Ventilators

No. 4610—4 p. bulletin on the "Vanco" power roof ventilator, an open top ventilator equipped with automatic opening and closing weather type dampers. Applications and construction are explained and a table of capacities is given. —E. Van Noorden Co., 100 Magazine St., Boston 19, Mass

Safety First Instructions

No. 4611—36 p. booklet for employees on greater safety and finer workmanship, designed to promote and maintain cooperation between employees and maintenance and emphasizing safety first rules and regulations.—Economy Pumps, Inc., 1000 Weller Ave., Hamilton, Ohio.

Steam Plant Equipment

No. 4612—12 p. bulletin (G-1306) describing boiler blowoff valves, water columns and gages, expansion joints, steam traps and strainers, spray nozzles, and liquid level indicators, with information on how to specify them.—Yarnall-Waring Co., Chestnut Hill, Philadelphia 18, Pa.

Steam Traps

No. 4613—16 p. bulletin (T-1738) on "Yarway" impluse steam traps for power plants, steam distribution systems, industrial steam processes, and marine service. Features, operation, and construction details are given in full and there are sections on how to figure sizes, installation and operation, capacities and prices, and weights and dimensions.—Yarnall-Waring Co., Chestnut Hill, Philadelphia 18, Pa.

Technical Books

No. 4614—New catalog of technical books, including volumes on chemistry, technology, physics, general science,

The Pipe Joint Cement that goes farther

Rutland Pipe Joint Cement gives you more bulk per pound. That means it goes farther and saves money. Seals joints tightly—lasts indefinitely—yet always leaves pipes easy to disjoin. Remains soft in can. Does not stain hands or fixtures.

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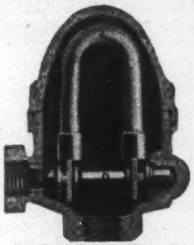
HAINES TRAPS



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Our operating member, the Bourdon Thermostatic Tube, is the strongest thermostat ever built into a Steam Trap. As the Bourdon Tube is used in gauges where accuracy is vital, it must improve the efficiency of a Trap.

There is no question whether a Haines Trap is functioning properly . . . it can be examined under pressure by simply removing the cover and all working parts are before you.

These Traps are designed to take care of any low pressure job up to 15 lbs. They will not become air bound as they employ the Bourdon Tube on the by-pass. Our underslung valve principle makes it safe at all times. No danger building up a pressure with this type of valve.

Furnished in sizes 3/4", 1" and 1 1/4".

F & T TRAP

WILLIAM S. HAINES & CO.
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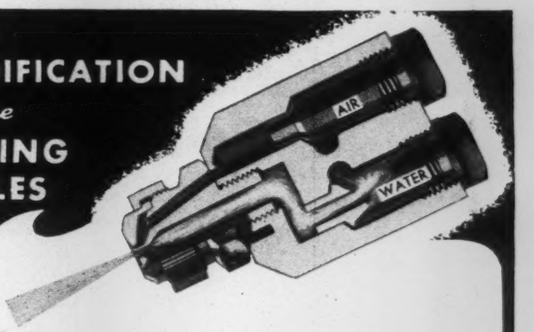
BETTER HUMIDIFICATION *with these* **SPRAYING NOZZLES**



These siphon type pneumatic atomizing nozzles are designed to provide better humidification, more dependable nozzle performance and minimum maintenance. Each nozzle has its own air and water line strainer . . . can be cleaned while complete system is in operation. Humidifying assemblies are supplied with nozzle, pipe, valve and fittings.

The complete Spraying Systems line includes all types of nozzles for air washers . . . nozzles and all fabricated parts for roof spraying systems, spray cooling towers and spray ponds.

"Whirljet" Nozzle for air washers and cooling systems.

Your copy of the new Spraying Systems catalog is ready now. Contains complete facts and engineering tables—send for it today.

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NOZZLES
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Yarway Involute Design—with no internal parts or vanes — insures non-clogging trouble-free service. Sizes and types to meet all requirements. Successful installations of Yarway Involute Nozzles in water cooling and air conditioning service total more than 5 million gallons per minute. Write for Bulletin N-616.

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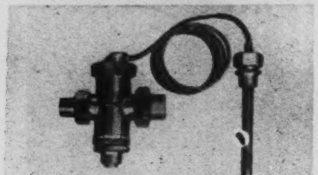
Control temperature of ALL LIQUIDS



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This Control is showing manufacturers and processors a new idea in simple *low cost*, efficient tank and process TEMPERATURE CONTROL. Effective in steam-heated hot water tanks, fuel oil preheaters, plating baths, heat exchangers — wherever liquids must be kept at constant temperatures. For pressures up to 125 pounds, temperature ranged to 300° F. Saves on *first cost* and in *production cost*.

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GOT A WATER SCALE PROBLEM?

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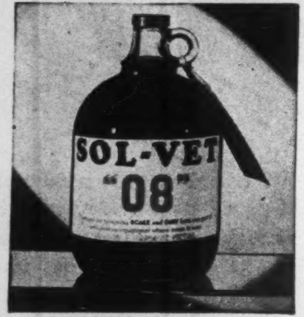
● SOL-VET "08" is a fast, efficient cleaner of scale, rust, slime, dirt, algae for all equipment using water for cooling. By dissolving impurities completely, they are carried out *in solution*, thus preventing clogging. Head pressures fall to normal; heat transfer is raised to maximum; full circulation is restored; life of equipment prolonged. On large jobs, shutdown time is cut to a maximum of 6 to 8 hours.



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If you find SOL-VET "08" not exactly as represented, when used according to instructions and full, accurate report is given within 30 days from date of purchase, your money will be refunded.

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when used as directed, to all water conducting materials in water cooled equipment.

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mathematics, engineering, radio, aviation, foods, formularies, metals, technical dictionaries, etc.—Chemical Publishing Co., Inc., 26 Court St., Brooklyn 2, N. Y.

Thermometers for Frozen Food Locker Plants

No. 4615—Data sheet on recording thermometers for use in frozen food locker plants with information on installation, specifications, etc.—Bristol Co., P. O. Box 1790, Waterbury 91, Conn.

Torch Brazing with Silver Alloys

No. 4616—2 p. instruction sheet for torch brazing with silver alloys. Seven standard steps are summarized and "by following the correct procedure, torch brazing with these alloys is a safe, economical, and most reliable operation."—Handy & Harman, 82 Fulton St., New York 7, N. Y.

Ventilation for Industry

No. 4617—8 p. condensed catalog (431) on engineered ventilation for industry, giving descriptions, specifications, and capacity tables for the manufacturer's gravity stack heads, ventilators, roof fans, exhaust fans, ventilating roof valves, and other products.—Allen Corp., 9767 Erwin Ave., Detroit 13, Mich.

War Production

No. 4618—24 p. booklet telling the story of the new American helmet and what it means to our armed forces.—McCord Radiator & Mfg. Co., 2587 E. Grand Blvd., Detroit, Mich.

Weld Bend Tests

No. 4619—Pad of record forms for facilitating weld bend tests. The pad contains 25 sheets each approximately 3 in. by 6 in., one edge of each sheet being carefully ruled in 1/50ths of an inch. Complete instructions for the use of these forms are included.—Tempil Corp., 132 W. 22nd St., New York 11, N. Y.

● MEETINGS & CONVENTIONS ●

Heating and Ventilating Engineers

American Society of Heating and Ventilating Engineers, 50th annual meeting, January 31-February 2, Hotel Pennsylvania, New York City. A special program dealing with the past, present, and future is being planned. See ASHVE Journal Section in this issue for further information. Secretary, A. V. Hutchinson, 51 Madison Ave., New York 10, N. Y.

Foundrymen's Congress

American Foundrymen's Association, third war production foundry congress, week of April 25, Memorial Auditorium, Buffalo, N. Y. There will be exhibit booths for conference and consultation and displays of models, products, and equipment. Secretary of the AFA is R. E. Kennedy, 222 W. Adams St., Chicago, Ill.

Hot Water, Radiant Heat Controls

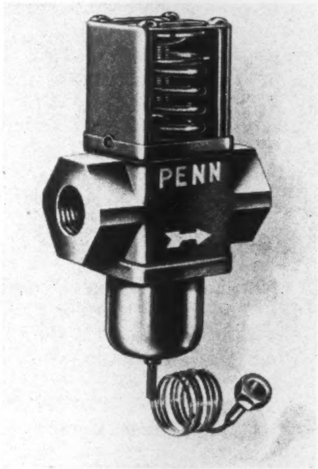
The Sarco Co., Inc., New York, New York, has announced the formation of a new company, to be known as Sarcotherm Controls, Inc., to market the company's weather controls for hot water and radiant heating, as well as other heating system controls. Headquarters of the new company are in the Merchandise Mart, 222 W. North Bank Drive, Chicago 54, Ill.

E. M. Mittendorff, of Sarco's Chicago office, has been elected Vice President of the new company and will act as its general manager. He has had a wide experience in designing and installing heating systems of all types for many years.

• EQUIPMENT DEVELOPMENTS •

For your convenience in obtaining more information about any of this equipment, see coupon on this page. Add the new products and companies listed here to your Directory Section which you received in your January 1944 Heating, Piping & Air Conditioning and thus keep your records of sources of supply up to date throughout the year. Single asterisk indicates equipment not listed in Directory Section; double asterisk equipment and manufacturer not listed.

Water Regulating Valves



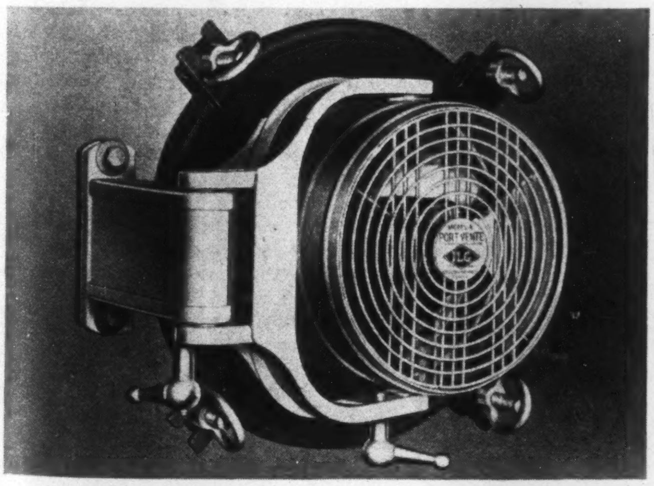
No. 2551—Two new series of water regulating valves for water cooled refrigeration compressors and condensers have been developed by Penn Electric Switch Co., Box 556, Goshen, Ind. Sizes in both "series 246," commercial type, and "series 246-N," Navy type for marine service, are available with threaded and flanged connections. A complete range of sizes from ¼ to 4 in. will be available.

These water regulators incorporate greater sensitivity to refrigerant head pressure, minimum spring power requirement, and insure free movement of all working parts, according to the manufacturer. New design eliminates sticking of seats, water hammer, drain plugs, rusting of range springs, need for lubrication, corrosion of and sedimentation on sliding parts, it is stated. Inlet and outlet water pressure forces on the port are controlled by the use of two rubber diaphragms which also serve as gaskets to prevent leakage; all sealing bellows are eliminated. Range spring and sliding parts are not submerged in water. Use of rubber diaphragms and internal design of the valve body eliminate necessity for a drain plug. Drainage of the valve is not necessary for winter or other standby periods because if freezing occurs, the rubber diaphragms compensate for any expansion with the valve body.

Electric Porthole Ventilator for Ships

No. 2552—Details on the new "Portvente" electric porthole ventilator have been released by the Ilg Electric Ventilating Co., 2850 N. Crawford Ave., Chicago 41, Ill.

The one fan in the unit gives triple duty aboard ship, according to the manufacturer. Designed with a rugged support fastened securely to the adjacent ship side, the ventilator fits quickly and snugly into the porthole. In one position it pulls in outside air for comfort of passengers, officers, and crew. Second, by means of a supporting arm with hinge, the complete fan unit can be rapidly reversed (180 deg) to exhaust stale air, smoke, and odors. Finally, with another quick adjustment of the supporting arm and hinge, the complete fan unit swings back out of the porthole and locks into any desired position for use as a circulating fan, a feature particularly desirable during heavy weather.



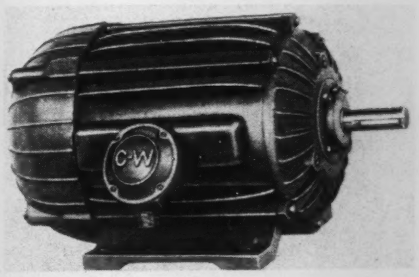
For blackout protection, the unit is provided with a weatherproof deadlight adaptor panel which fits into the porthole and is fastened with tumble bolts from the inboard side. To the panel, which is removable in an emergency when portholes are required as escape hatches, is attached an interlocking, die formed deadlight louver that prevents transmission of light with minimum restriction to the air flow. The deadlight louver meets blackout requirements of the U. S. Maritime Commission, says the maker.

Hot Water Generator for Marine and Land Use

No. 2553—An oil burning, fully automatic, hot water generator recently announced by Air Devices, Inc., 17 E. 42nd St., New York 17, N. Y., is simple, light in weight, and efficient, says the manufacturer. Designed especially for marine hot water and heating service, where compactness, safety, automatic control, and simplicity are required, the "Agitair" generator is also recommended for hot water service on many land applications.

The generator is down-fired, with a multiple pass over the heat absorbing surfaces. Combustion occurs in a carborundum chamber through which the flame has a corkscrew travel. There are no negative drafts and no smoke, eliminating necessity for special stacks, it is stated.

Totally Enclosed, Corrosion Resistant Motor



No. 2554—The Crocker-Wheeler Electric Mfg. Co. Div. of the Joshua Hendy Iron Works, Ampere 1, N. J., has announced the "Sealedpower," corrosion resistant motor, which is suitable for operation in atmospheres containing injurious dusts, corrosive vapors or gases, and excessive moisture, such as are often encountered in chemical plants, textile mills, food plants, and mines. Available in sizes from 1 to 15 hp, this motor can be furnished for operation from any polyphase power supply.

Heating, Piping & Air Conditioning, [2-44]
6 N. Michigan Ave., Chicago 2, Ill.

Please ask the manufacturers to send me more information about the equipment mentioned under the following reference numbers in Equipment Developments and Recent Trade Literature.

(Circle each number in which you are interested)

2551 2552 2553 2554 2555 2556 2557
4620 4621 4622 4623 4624 4625 4626 4627 4628 4629
4630 4631 4632 4633 4634 4635 4636 4637 4638 4639
4640 4641 4642 4643

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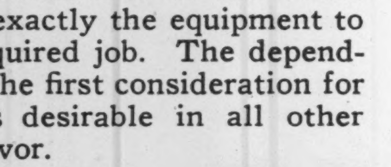
REQUIRES
MOTOR CONTROLS

So important are the requirements for fluids aboard ship that only the most dependable controls are used in the regulating and pumping systems.

Ward Leonard motor starters are furnished in great numbers for use on war craft and merchant men. They are Ward Leonard designs that meet navy requirements.

Users of motor starters for marine and other purposes will find in the Ward Leonard Line exactly the equipment to best do the required job. The dependability that is the first consideration for nautical use is desirable in all other types of endeavor.

Send for data sheets and bulletins describing Ward Leonard Motor Starters and other control devices.



Typical Ward Leonard Motor Starter for use aboard ship.

WARD LEONARD
RELAYS • RESISTORS • RHEOSTATS
Electric control (WL) devices since 1892.

WARD LEONARD ELECTRIC COMPANY
31 SOUTH STREET, MOUNT VERNON, N. Y.

It is of the totally enclosed, fan cooled type, but there are no cooling ducts to become fouled with wet or sticky dusts. In addition to the mechanical sealing of the entire motor, each coil is individually sealed against moisture, fumes, vapor and dust by a vacuum impregnation process.

Plastic for Piping and Tubing

No. 2555—A new plastic, polythene, adaptable to the manufacture of products as varied as collapsible tubes for toothpaste, waterproof coatings, tubing and piping, adhesives, and insulation for electric wiring and cables was announced last month by the plastics department of E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

This new member of the plastics family represents the culmination of intensive experimentation and development undertaken five years ago. Polythene is the generic name for the tough plastic manufactured by the polymerization of ethylene.

In announcing that polythene is now being manufactured in commercial quantities, it is emphasized that the material is available in substantial quantities only by specific allocation for war purposes.

The new plastic is readily molded and fabricated by present methods with existing molding and shaping equipment. It can be extruded, injection molded, compression molded, and calendered. In sheet, rod, or tube form it can be machined, cut, blown, blanked, or swaged.

Splashproof Motors

No. 2556—"Form J" splashproof motors in sizes from 1½ to 15 hp are now available with two way ventilation, the Century Electric Co., 1806 Pine St., St. Louis, Mo., has announced.

The cooling air is drawn in through baffled openings in the bottom of the end brackets by a fan on each end of the rotor, blown through and around into all parts of the motor, and out through louvered openings in the side of the frame below the center line and at the bottom. This construction protects the vital parts of the motor during plant wash down or for outdoor operation.

Army Aero-Medical Laboratory Creates All Kinds of Weather

No. 2557—Army research men at the world's largest aviation proving grounds at Wright Field, Ohio, have become their own "weather men," manufacturing at will desert sand storms, arctic hurricanes, and samples of the stratosphere nine miles above the earth to test fliers and their equipment.

The artificial weather is created in an aero-medical laboratory. Equipped by air conditioning engineers of the York Corp., Roosevelt Ave., York, Pa., the installation includes a steel stratosphere test chamber and a refrigerating plant capable of producing nearly every type of climate in the world.

In a stainless steel lined room sealed from the outside air, Army experimenters can switch from an Alaskan winter at 50 below zero to the climate in a tropical sea 150 above zero. Inside the Army air forces stratochamber a few feet away the temperature is dropped and air pressure reduced to a partial vacuum to simulate an altitude of 45,000 ft.

The sensation of shooting into the stratosphere at 600 mph is created in the stratochamber when atmospheric pressure is depressed from a normal of 14.7 psi to less than 2 psi in 4½ minutes. The weather room and the stratochamber combined require 9 tons of refrigeration a day.

The new weather room has its own artificial "sun" made up of batteries of both ultraviolet and powerful infrared

heat lamps to simulate as closely as possible the actual sunburning and heating effect of a tropical sun. A total of 15,000 watts of ultraviolet energy is produced by the sunlamps alone. Even a "tropical sea" and life rafts can be added to the scene by flooding the steel lined room with sea water.

Huge fans and blowers are being put to work to whip up artificial sand storms, tropical rain storms and icy gales and sleet storms at humidities ranging from abnormally dry to 100 per cent of saturation. The room can also be filled with a thick blanket of fog. Effects of this manufactured weather are observed through observation windows 6 in. thick and built of five thicknesses of glass to prevent vaporizing or frosting which would obstruct the view. Stainless steel walls of the room protect it against leaking and corrosion.

Every bit of gear which a pilot carries is subject to tests in the all-weather room. Included are life rafts, emergency food rations, and all articles of clothing, especially vital items such as raincoats, gloves, and sleeping bags. In the case of emergency rations, metabolism tests are made in the chamber on air force subjects after they have eaten the food.

In the picture, the operator in the foreground is recording the skin temperature of a subject who has endured 40 below zero temperature for hours in the all-weather chamber behind the thick glass window (center, back). Tiny wires attached to all parts of subject's body transmit his skin temperature to the recorder.

MOTOR CONTROLLERS EASED. WPB announced it had relieved manufacturers of electric motor controllers from technicality of obtaining an AA-5, or higher, priority before starting production on these units or parts therefor. (Limitation order L-250, as amended.)

CHEMICAL INDUSTRY RATING CHANGED. Chemicals manufacturers operating under preference rating order P-89 hereafter will be assigned individual preference ratings and allotment symbols for application to their purchase orders for maintenance, repair, and operating supplies, in place of blanket rating of AA-1 and allotment symbol MRO-P-89, formerly provided by P-89, it was announced by WPB.

WARTIME
EXPERIENCE

points to

POSTWAR PERFECTION

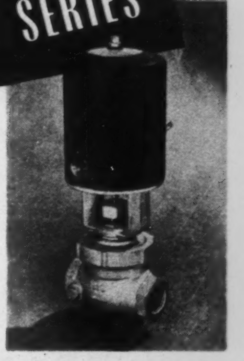
Since automatic controls are essential to modern, mechanized warfare, the greater part of our production is devoted to turning out vitally necessary precision built equipment.

The specialized skills used to hasten the day of Victory will also serve after the peace is won. When that day comes, knowledge gained from wartime experience will be used to good advantage.

Automatic controls will give the American of tomorrow even higher standards of living and production efficiency than those now enjoyed. We will be ready to maintain our reputation as pioneers and leaders in this field.

**TWO-WAY
CURRENT
FAILURE
VALVES**

G-1 SERIES



General Controls G-1 Series Valves are two-way current failure *Hydramotor Valves designed for operating pressures up to 300 lbs. G-1 Valves are suitable for gas, oil, water, air and steam. Approximate opening time 8-10 seconds; closing—2 seconds. Operator dimension only 4¼", diameter 6" high, weight approximately 7½ lbs. Write for Catalog 52.

*Trademark registered United States Patent Office.

GENERAL CONTROLS

801 ALLEN AVENUE, GLENDALE 1, CALIFORNIA
BOSTON • NEW YORK • PHILADELPHIA • DETROIT
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SOMETIME (SOON?)

PETRO

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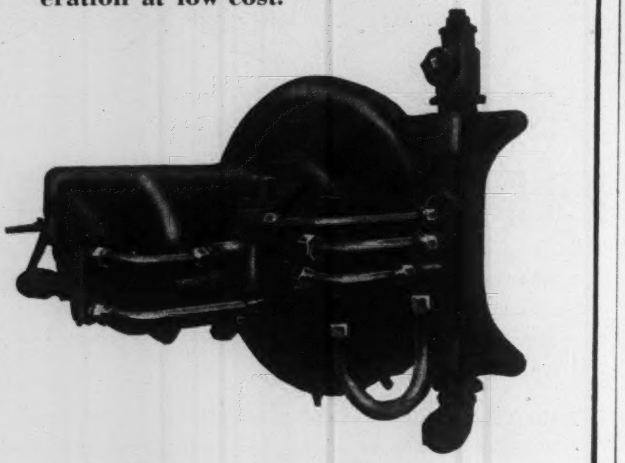
OIL BURNING SYSTEMS

will be available once more for normal business.

Their "Oil Miser" economy will contribute much to post-war efficient operation at low cost.



Automatic, semi-automatic or manual operation using No. 5 (or lighter) oil —or No. 6 (Bunker "C") oils, preheated. Capacities to 145 gallons per hour. 487 boiler H. P.—68,000 sq. ft. steam.

Even war-time research has not discovered any method of heavy oil combustion that equals or improves Petro's Thermal Viscosity principle of automatic firing at constant efficiency.

As a principle of design and operation, rather than a mechanical part, it can't wear out or break down. It cuts "service" as well as operating supervision.

Petro Engineers are working on post-war plans with a lot of Contractors. Can they help you?

OIL IS AMMUNITION USE IT WISELY

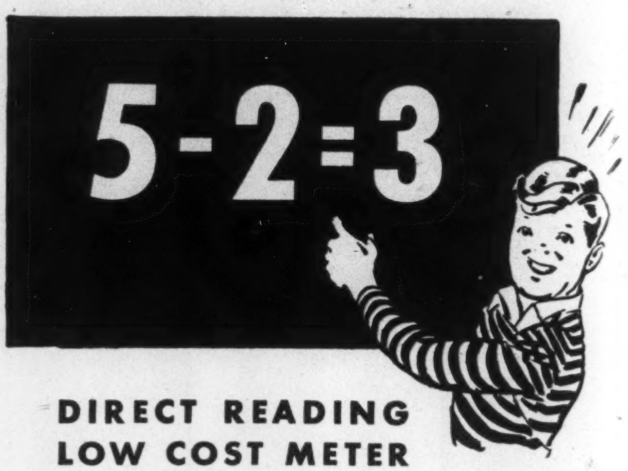
Full data on Petro Industrial Burners are in our Catalog—see Sweet's or Domestic Engineering Catalog Files—or we will gladly send copies on request.

PETROLEUM HEAT AND POWER COMPANY

Makers of Good Oil Burning Equipment Since 1903

STAMFORD CONNECTICUT

ANYONE WHO CAN SUBTRACT *Can Read it*



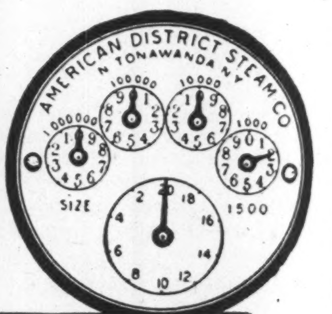
DIRECT READING LOW COST METER

It's just as easy to read an ADSCO Rotary Condensation Meter as it is to read the gas or water meter in your basement. Large, easy to read dials record the total amount of steam consumed to date. By subtracting the previous reading, you have the amount of steam consumed for the current period.

You can use this meter wherever all condensate from steam process or heating lines can be recovered to pass through the meter. Inasmuch as a pound of steam condenses into a pound of water, by metering the pounds of condensate, you have an accurate measurement of the pounds of steam consumed.

This low cost meter will enable you to arrive at accurate steam costs for separate buildings, departments, processes — enable you to render proper bills if you sell steam to others.

Tell us the maximum pounds of condensate per hour or the square feet of equivalent direct radiation in the building or department to be metered, and we will tell you how surprisingly little it will cost to put your steam consumption on an accounting basis. Also ask for bulletin 35-80H.P.



Meter counter records in pounds of condensate on a non-fogging, easy to read dial.

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NORTH TONAWANDA, N.Y.
MAKERS OF "UP-TO-DATE" STEAM LINE EQUIPMENT FOR OVER 60 YEARS

It doesn't take an Engineer to read it

ADSCO ROTARY CONDENSATION **METER**

RECENT TRADE LITERATURE

For your convenience in obtaining copies of these bulletins, see coupon on page 141. If you write direct to the manufacturer, describe carefully what literature you want, as the number given first in each item is for use only when sending in your request to Heating, Piping & Air Conditioning.

Air Conditioning Problems and Solutions

No. 4620—8 p. booklet for plant managers and engineers, process engineers, plant superintendents, and research laboratories, delineating a few problems—and their solutions—in temperature and humidity control, including that of tempering steel for uniform hardness, problems encountered in the plastics industry where resins are unworkable under certain atmospheric conditions, and problems in the aviation, drug, cosmetic, dehydration, glass, and munitions industries.—Carrier Corp., 302 S. Geddes St., Syracuse, N. Y.

Aircraft Motors

No. 4621—28 p. bulletin on aircraft motors which have two design characteristics—high speed operation and new light metal construction. According to the manufacturer, these characteristics will prove extremely valuable in designing more efficient motors for postwar equipment and appliances. Important design factors are discussed and illustrations, sketches, and tables of data are presented.—Emerson Electric Mfg. Co., 1847 Washington Ave., St. Louis 3, Mo.

Air Diffusers, Exhausters and Filters

No. 4622—12 p. bulletin (R201) giving information on "Agitair" air diffusers, air exhausters, air filters, hot water generators, heat baffles for oil burners, hot gas generating furnaces, heavy duty ranges, and bake ovens and stoves. Various products are carefully illustrated and briefly described.—Air Devices, Inc., 17 E. 42nd St., New York 17, N. Y.

Boilers

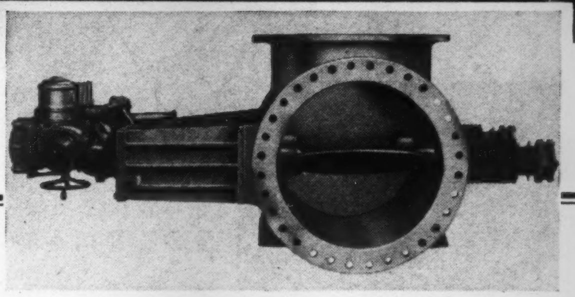
No. 4623—16 p. bulletin on "Type CP" steam generators, completely steel encased and insulated units which have a number of features. Units as large as 250 hp can be shipped completely assembled. Construction features are discussed and illustrated, and diagrams, dimensions, and ratings are tabulated. — E. Keeler Co., 238 West St., Williamsport 3, Pa.

Carbon Seal Rings

No. 4624—8 p. booklet dealing with carbon seal rings and their application to bellows type shaft seals, detailing the features of the rings with relation to their specific uses on water pumps and as turbine seals, air seals, etc.—Pure Carbon Co., Inc., St. Marys, Pa.

Centrifugal Pumps

No. 4625—4 p. bulletin (W-321-B15) on balanced "Monobloc" two stage centrifugal pumps for general water service, cooling tower service, small boiler feed service, condensate service, and other applications, illustrating features and giving dimensions and ratings. Also, 6 p. bulletin (W-321-B14B) on single stage balanced centrifugal pumps for similar services. Also, 4 p. bulletin (W-321-B7C) on open impeller centrifugal pumps for use in chemical plants, canneries and packing plants, sump pumping, in breweries and distilleries, etc. Also, 4 p. bulletin (W-321-B13B) on steam turbine drive centrifugal pumps for air conditioning, heating, refrigeration, power and industrial plants, oil refineries, breweries, etc.—Worthington Pump & Machinery Corp., Harrison, N. J.



No. 604

Weight of unit—8500 lbs. Note dual finned, lubricated stuffing boxes for elevated temperature and high working pressure.

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in a Three-Way Valve

(Patent Applied For)

The simplified design and quick action of the modern R-S Butterfly Valve has been applied to a three-way valve, which is unequaled for quick interchange and mixing service. Rugged construction for all pressures from 15 to 900 psi. Adapted to manual control as well as power operation and elevated temperatures.

Here, then, is another example of R-S Valve Engineering that has proved its superior efficiency in many services. Write for details and the new R-S Catalog No. 14-B.

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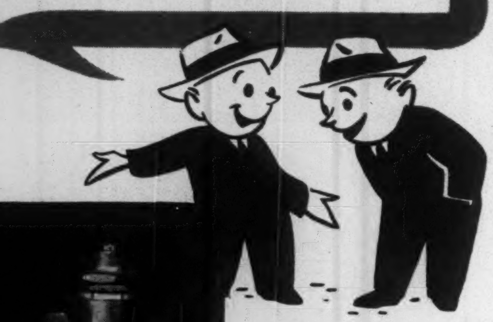
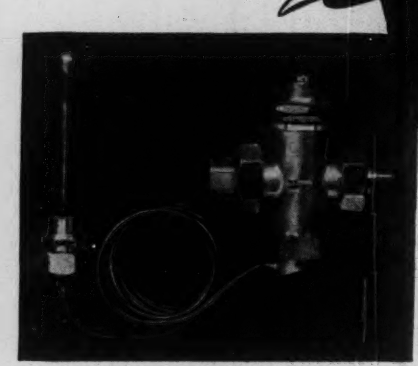
Keep Liquids at Constant Temperature . . . *Automatically*





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• You take the human element out of liquid temperature control with the STERLING No. 150. The result — savings in fuel, labor, power, increased heating and processing efficiency, even with inexperienced help.

• Self-contained, self-operated, the STERLING Tank and Process Control maintains liquid temperatures steady, within 1° F. plus or minus. It is particularly valuable in hospitals, hotels, and institutions, where hot water in storage must be maintained at constant levels. Food, dairy, chemical and industrial plants of all types find it highly profitable to use in steam-heated hot water tanks, fuel oil pre-heaters, plating baths, heat exchangers, and cooking and processing equipment of many kinds.

• Write today for details on the STERLING No. 150 Tank and Process Control. It's available in a wide range of capacities — up to 125 lbs. pressure, and at temperatures up to 300° F. Three sizes; No. 150—½" to 1"; No. 117—1¼" to 2"; No. 111—2½" to 3".

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TEMPERATURE CONTROLS • HEATING SPECIALTIES

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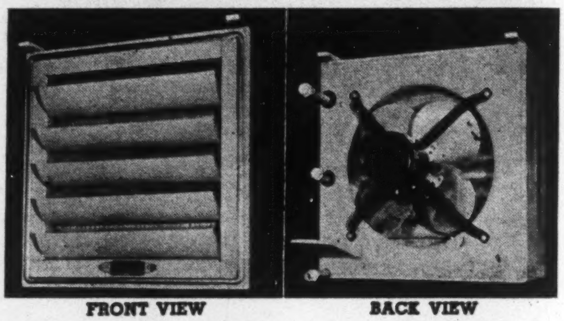
2 *Victory* ITEMS by KRAMER

DESIGNED to comply with the latest government limitations on critical materials. The number of styles and models has been reduced to facilitate quick delivery.

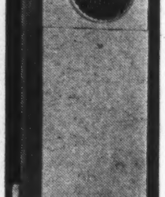
KRAMER *Victory* COOLMASTER



FRONT VIEW BACK VIEW

OUTSTANDING FEATURES: Accurately rated. All ratings based on tests made in accordance with accepted standards and are guaranteed. ● No welded or soldered return bends. ● Can be used with Freon, Methyl, Sulphur, Ammonia, or Brine. ● Heat Interchanger is furnished. ● One man suspension brackets for easier mounting. ● Unusually pleasing in appearance. ● Finished in chrome gray shade of crackle; baked on a bonderized (rustproofed) base. Silent, carefully balanced fans direct connected to totally enclosed motors specially built for fan duty and long life.

KRAMER *Victory* PANEL UNITS



WALL MOUNTING

OUTSTANDING FEATURES: All steel coil, hot galvanized after fabrication. ● Accurately rated. ● All ratings based on tests made in accordance with accepted standards and are guaranteed. ● Heat Interchanger is furnished. ● Carefully balanced fans direct connected to totally enclosed motors built for fan duty and long life. ● Finished in baked chrome grey crackle paint.

DESCRIPTIVE LITERATURE SENT ON REQUEST

KRAMER TRENTON COMPANY
Trenton, New Jersey

Direct Fired Heaters

No. 4626—16 p. bulletin (509) dealing with economy of use and installation of direct fired air heaters and their flexibility of application. Diagrams showing nine basic designs and giving Btu capacities, dimensions, and specifications on 44 models are presented. Standard sizes, many of which are shipped completely assembled, range from 650,000 to 8,000,000 Btu per hr capacity.—Dravo Corp., 300 Penn Ave., Pittsburgh 22, Pa.

Draft Control

No. 4627—4 p. bulletin on the motorized and nonmotorized "Draft-O-Stat" which, according to the manufacturer, will cut fuel consumption 10 to 30 per cent on any automatic coal or oil burning furnace, and which is available to consumers without priority. Features and installation are briefly described. — Hotstream Heater Co., 8007 Grand Ave., Cleveland, Ohio.

Dust Collectors

No. 4628—4 p. bulletin (910) on industrial type unit dust collectors. Construction features and applications of this self-contained equipment are shown.—Pangborn Corp., Pangborn Blvd., Hagerstown, Md.

Electronic Tubes for Industry

No. 4629—4 p. bulletin (ET-12) presenting a quick selection chart of electronic tubes for various industrial applications.—General Electric Co., 1 River Rd., Schenectady, N. Y.

Fasteners

No. 4630—16 p. engineering data bulletin on cowl fasteners for aviation work which have possible applications for inspection panels on air ducts, air conditioning units, furnaces, etc. Important features, sizes and types are discussed, and specifications are given.—Talon, Inc., Steel Tube Div., Oil City, Pa.

Flow Meter Engineering

No. 4631—16 p. booklet (Reprint No. 29) on flow meter engineering, by William C. Bennett, "telling why, when, and where flow meter instruments are needed in the modern plant and how they can be made to further the war effort." There are 2 pp. of basic metering data and 2 pp. devoted to details of proper installation methods.—Cochrane Corp., 3131 N. 17th St., Philadelphia 32, Pa.

Metal Duplicating Without Dies

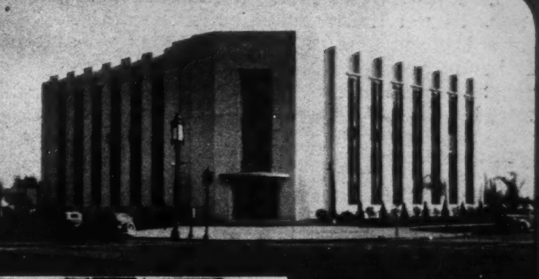
No. 4632—40 p. catalog (44-6) on the "Di-Acro" system of metal duplicating without dies, describing the various types of benders, shears, and brakes, and showing representative parts made with this equipment. There is also a section of questions and answers. — O'Neil-Irwin Mfg. Co., 316 Eighth Ave., S., Minneapolis 15, Minn.

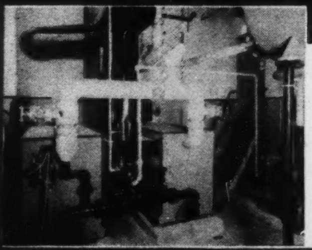
Pipe Hangers

No. 4633—28 p. bulletin (101) on "Genspring" pipe hangers, discussing the problem of proper pipe line suspension and giving data on stresses and vibration, and shock protection. The principle of this hanger, its construction and installation, and adjustment are discussed, and numerous sketches and data tables, together with formulas for determining the overall height of assembly, are presented.—Genspring, Inc., 500 Fifth Ave., New York, N. Y.

Plastics

No. 4634—24 p. non-technical booklet covering various types of plastics and their uses and giving general information on the industry. The properties of "Insurok" and other plastics which fit them to a wide range of present and postwar uses are explained.—Richardson Co., Department 100, Melrose Park, Ill.





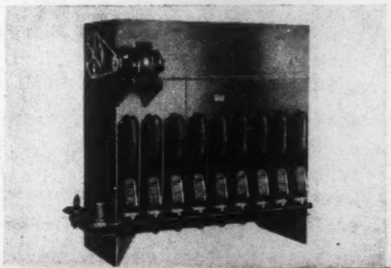
Mueller Gas Era Boilers in Farmers Insurance Interexchange Bldg., Los Angeles. Walker & Eisen, Architects. Johnston & Washer, heating contractors.

Half a century of experience backs up your good judgment

— when you select a

MUELLER boiler

Over 50 years of boiler-manufacturing experience stands behind the performance of Mueller Gas Era boilers. In the gas-boiler field, Mueller was one of the pioneers. These modern all-cast-iron gas-designed boilers live up to their nation-wide reputation because they embody definite Mueller features that assure easier installation, fuel economy, easy maintenance, long life. All castings assembled and pressure-tested at the factory for a positive, water-tight assembly. • Surface-ground iron-to-iron joints —easily cleaned. Simple non-mechanical burner and complete automatic controls. • Series A and AE for residences and small commercial installations. Series C for larger residences, apartments, stores, commercial and industrial buildings. Groups or batteries in any required capacity. AGA ratings 290 to 20,100 sq. ft. hot water; 180 to 12,600 sq. ft. steam with one set of controls. Write for bulletins. *L. J. Mueller Furnace Co., 2007 W. Oklahoma Ave., Milwaukee, Wis.* E-8



For space heating MUELLER gas-fired unit heaters

MUELLER *Milwaukee*

Powder Metallurgy

No. 4635—32 p. booklet on powder metallurgy, covering the advantages and latest applications of powdered metal parts. Of particular interest are the designers' aid section and a table on engineering properties. The second section of the booklet is devoted to "Selflube" porous bronze bearings and porous iron bearings, and graphite impregnated brass bearings.—Keystone Carbon Co., Inc., St. Marys, Pa.

Pyrometers

No. 4636—38 p. catalog (1101 H) on "Celectray" high speed photoelectric action pyrometers, with complete information on this equipment.—C. J. Tagliabue Mfg. Co., 550 Park Ave., Brooklyn 5, N. Y.

Sheaves

No. 4637—4 p. bulletin (B6310) on the "Magic-Grip" sheave for v-belt drives, presenting a series of six photographs showing the put on-take off operation, and with a sketch illustrating how the sheave is locked to the shaft. —Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.

Slide Films and Motion Pictures

No. 4638—84 p. catalog on slide films and motion pictures to help instructors, discussing pre-induction training courses and cataloging the available material which covers an extremely wide range of subjects including welding, mechanical drawing, hydraulics, mathematics, electricity, geometry, physics, etc.—Jam Handy Organization, 2900 E. Grand Blvd., Detroit 11, Mich.

Synchronous Motors and Control

No. 4639—4 p. bulletin (GEA-4139) on low speed synchronous motors and control for compressor drives, describing the application, emphasizing the necessity for providing the proper amount of flywheel effect, listing important construction features, and discussing motor protection.—General Electric Co., 1 River Rd., Schenectady, N. Y.

Valves and Fittings

No. 4640—110 p. catalog (43) on valves and fittings—screwed and flanged, malleable iron, cast iron and bronze. There is a complete general index and detailed information on the wide range of products is presented.—Jarecki Mfg. Co., 1345 W. 12th St., Erie, Pa.

Valves for Fire Protection

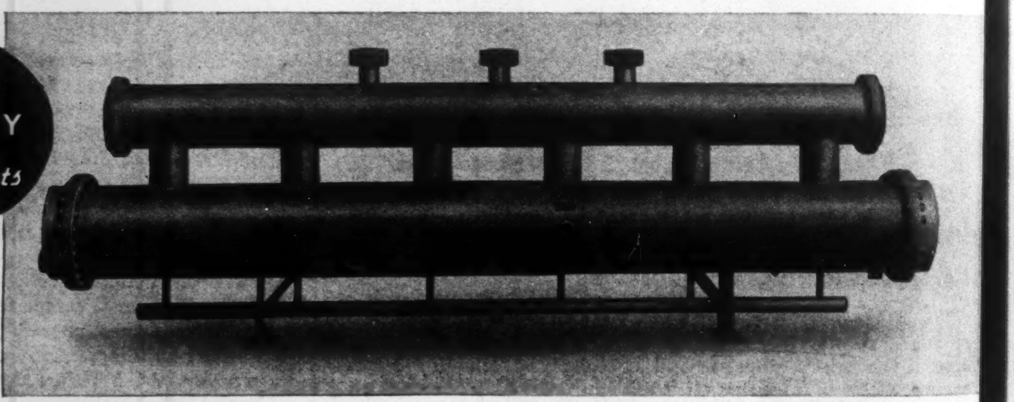
No. 4641—4 p. booklet on valves which are weight operated and have a pendulum stop for use in fire protection work. There is a closing type for emergency shut off for inflammable liquids or to concentrate water or steam in fire mains, and an opening type for diversion of water to sprinkler systems or to divert inflammable liquids to a point of safety. These valves may be controlled thermostatically, electrically or manually from any or many locations.—Everlasting Valve Co., 49 Fisk St., Jersey City, N. J.

Welding

No. 4642—16 p. issue of "Airco News" (Vol. 3, No. 3) devoted to the building of C-3 ships, emergency welding repairs and aircraft welding.—Air Reduction Sales Co., 60 E. 42nd St., New York 17, N. Y.

Weld Inspection Chart

No. 4643—Comprehensive arc welding inspection chart designed so that operators and inspectors can tell at a glance whether welds are being properly made. Pictures of actual specimens of various results obtained in making fillet and butt welds are shown, and the appearance and characteristics of proper and improper weld beads are described. Advantages and applications of the "Fleet-Fillet" welding technique are summarized.—Lincoln Electric Co., 12818 Coit Rd., Cleveland 1, Ohio.



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Service and Products

This Freon Cooler is the "flooded" type for chilling water, using Freon 12 as the refrigerant. Water circulates in the tubes; Freon in the shell. Excellent transfer rates. Particularly applicable to large installations.

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You're specialists... specialists in the broad field of air-conditioning and refrigeration. As such, you will appreciate the work done by other specialists.

Our business, too, is specialized. It includes the design and manufacture of certain equipment for the very systems you engineer or install. Freon coolers, such as illustrated, also heat exchangers, hot water storage heaters... these are *our* specialties.

When you come to Patterson-Kelley for equipment in the field outlined above you are coming to a company that has been engineering and manufacturing such equipment for many, many years. Our nearest office will serve you.

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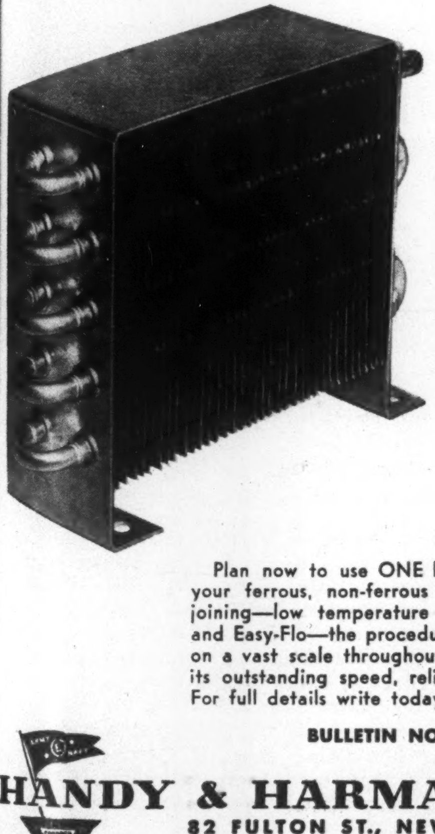
ONE BRAZING PROCEDURE

for ferrous, non-ferrous and dissimilar metals

—when you braze with

SIL-FOS and EASY-FLO

Fortunate were the users of Sil-Fos and Easy-Flo when metal restrictions made it necessary to change from non-ferrous to ferrous metals. They were able to make the change with no change whatever in their brazing methods. Where they had been using Sil-Fos, which joins non-ferrous metals only, they simply used Easy-Flo instead—which gave them the same fast, reliable, economical brazing production as before. The change back to non-ferrous metals will also require no alteration in brazing methods.



This refrigeration unit is a case in point. It is now made in all steel construction. The U-turns are brazed with 3/64" Easy-Flo wire and torch heating. Production runs into the thousands.

Plan now to use ONE brazing procedure for your ferrous, non-ferrous and dissimilar metal joining—low temperature brazing with Sil-Fos and Easy-Flo—the procedure that is being used on a vast scale throughout industry because of its outstanding speed, reliability and economy. For full details write today for a copy of

BULLETIN NO. 12-A.

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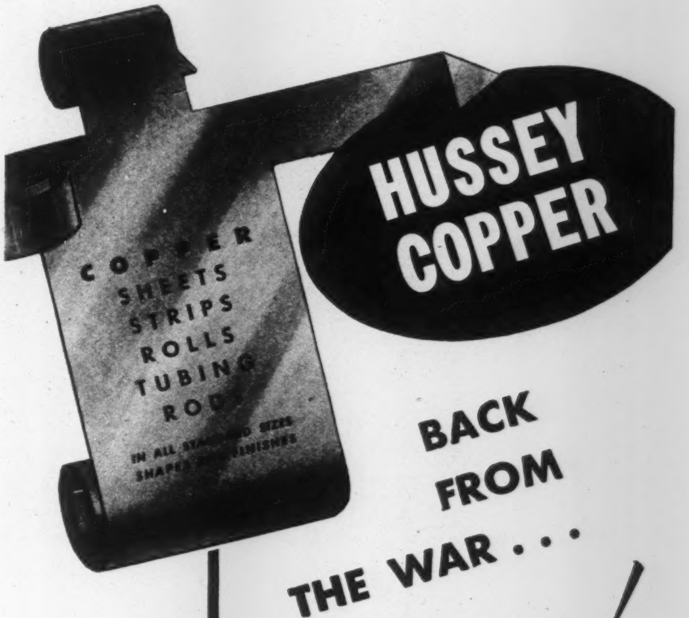

BACK FROM THE WAR . . . *Soon!*

WITH EVEN HIGHER STANDARDS OF UNIFORMITY —QUALITY—DEPENDABILITY

Specify

HUSSEY
for
POST-WAR
PLANNING

The many recognized properties that made Hussey Copper a "must" for War Service are advantages which will be indispensable to industry in peacetime activities.

Hussey research and engineering skill that have played an important part in the production of tremendous quantities of Copper so vital to winning the war, will be ready to help you in winning back your peacetime markets.

C. G. HUSSEY & COMPANY
(Division of Copper Range Co.)
Rolling Mills and General Offices: Pittsburgh, Pa.
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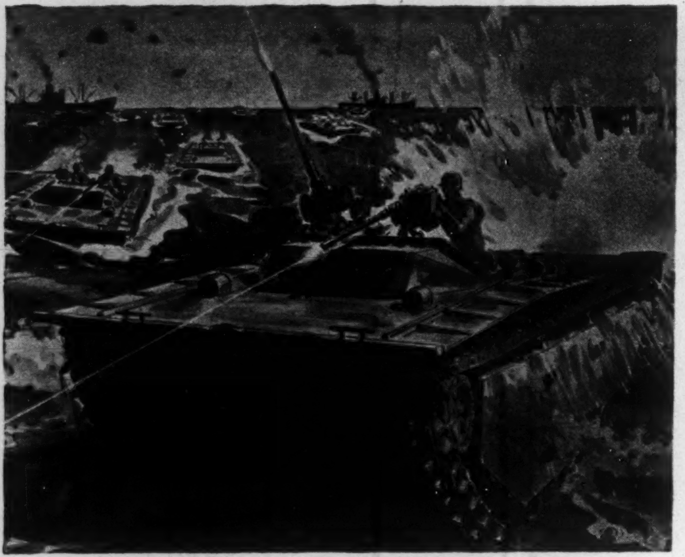


The vicious land and sea fighter

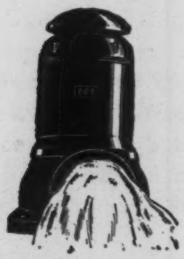
—the amphibious

WATER BUFFALO

Designed by the Engineers of

PEERLESS PUMPS

America's newest fighting fortress has gone to War with a vengeance. It's the Water Buffalo. It swims through sea and surf, it crawls over beachheads, up over rocky terrain, trundles through mud and swamps—it goes everywhere, loaded with devastation. Peerless engineers designed this deadly attacker. Their "know how" of engineering hydraulics—their everyday knowledge of water problems and their detailed knowledge of pumps, were largely responsible for Peerless engineers becoming the world's authority on amphibian tractor designs.



Needless to say, Peerless engineering forces have been greatly strengthened and have knowledge of real value to the pump industry.

First on the Waterfront— at War and at Home

PEERLESS PUMP DIVISION
Food Machinery Corporation

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Peerless
TURBINE PUMPS

PERFORMANCE WITH ECONOMY

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Canton 6, Ohio; San Jose 5 and Fresno 16, Calif.

NEW BOOKS & REPORTS

Installations by Baker, Smith & Co.

Heating, ventilating, power equipment, industrial piping, and air conditioning installations made by Baker, Smith & Co., Inc., are summarized in a beautifully gotten up book published (in a limited edition) last month. Started by a history of Baker & Smith since its founding in 1857, and concluded by a section introducing the staff of the present organization, there are numerous illustrations of office and insurance buildings, hotels and clubs, housing and apartments, universities, libraries, churches, banks and department stores, hospitals and institutional buildings, manufacturing buildings, and miscellaneous structures.

There is also a map and listing showing the geographical locations of this company's installations—from coast to coast, from Canada to the Gulf, and including the J. De La Borbolla hotel in Madrid.

Story of Growth and Daring

Fifty Years of Inland Steel, by Wayde Grinstead, is a story of growth and of daring, too — for the men who founded the company in the midst of a bad depression had more nerve than capital.

The story of Inland's first 50 years, from the early struggles to keep second-hand machinery running to the achievements of today, is well-told and well-illustrated. From 40 carloads of antiquated machinery sitting on a railroad siding, with demurrage charges mounting daily, to the integrated organization of the present is—to put it mildly—a "far cry." Today, the Indiana Harbor plant alone covers 630 acres; five blast furnaces, 273 coke ovens, and 36 open hearths feed the busy mills. The annual payroll in 1942 was $48,000,000 for 20,000 employees.

New List of American Standards

The American Standards Association, 29 W. 39th St., New York 18, N. Y., announced recently the publication of its new list of standards. There are more than 600 standards listed, of which 64 have been approved or revised since the last price list was printed in April 1943. The standards cover specifications for materials, methods of tests, dimensions, definitions of technical terms, procedures, etc.

American standards are constantly revised to keep up with advances in industrial methods. This list represents the cumulative work of the past 25 years. Copies of the list are available from the ASA, free of charge.

Evaluation and Interpretation of the Cooling Power

In the second of a series of articles on the Practical Evaluation and Interpretation of the Cooling Power in Bioclimatology, by Robert G. Stone of the Blue Hill Observatory, Harvard University, published in the November 1943 bulletin of the American Meteorological Society, the computation of solar radiation effects is discussed and there are sections on the effect of clothing, the wet cooling power formulas, evaporating power, sensation scales, presentation of cooling power data, and physiological correlations.

In his conclusion, the author repeats "what continental authorities concede," that for general climatic purposes, the cooling power is preferably computed rather than measured.

An extensive selection of references on cooling power are given with this paper.

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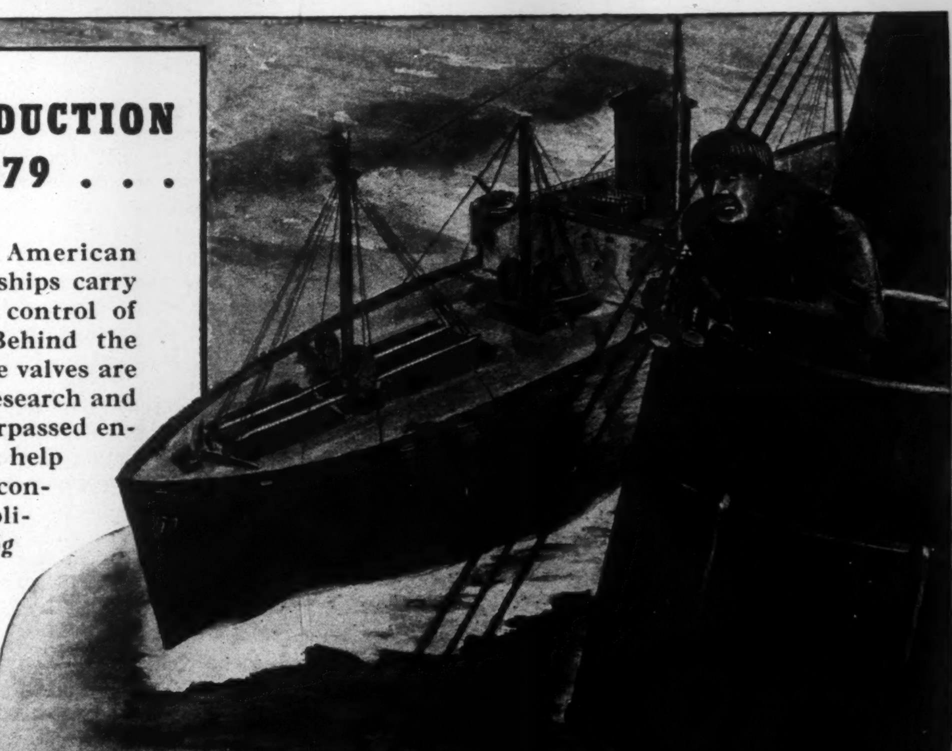

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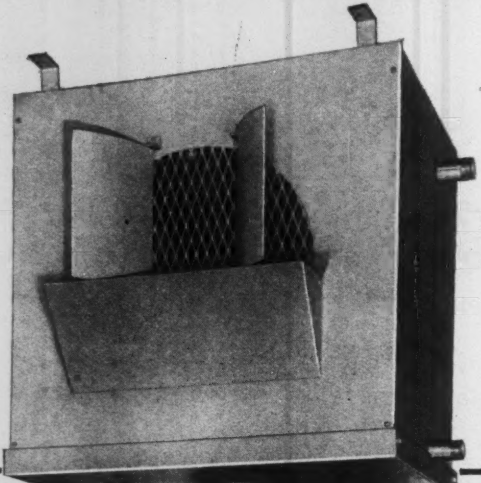

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Postwar Planning by Boiler Manufacturers

Postwar planning, research, the proposed publication of an installation manual, the I-B-R code, and publicity were among the subjects discussed at the recent annual meeting of the Institute of Boiler and Radiator Manufacturers.

The feature of the meeting was a comprehensive report on postwar planning presented by Robert S. Waters, chairman of the institute's postwar planning committee. According to the report, "It is generally conceded that industry must plan to provide a high level of productive employment after the war. If the capitalistic system is to accomplish the things that will be expected of it, we all shall have to:

"1. Keep everlastingly pressing Washington for sane and sensible tax reform that will permit accumulating reserves to assist in the postwar conversion of plants for the production of peacetime products.

"2. Insist upon economy in government expenditures through the elimination of needless bureaus and stopping the extravagant waste of public funds.

"3. Insist that there be a clearcut enunciation on the part of the federal government of its recognition of the nation's belief in the free enterprise system.

"4. Urge the adoption of a sound national labor policy that would eliminate legislative wedges that have been driven between employer and employee."

The committee summarizes the objective of the boiler and radiator industry's postwar planning as being this: "To furnish better products to the public at lower prices and at the same time return a reasonable profit to ourselves."

Among the subjects discussed in this section of the report are the following: The institute as a source of information to its members and the government; promotional activities for the utilization of the industry's products; customer and allied industry relations; an industry program with respect to labor problems; OPA and WPB advisory committees; profitableness of industry; distribution costs; and a financial policy of the industry.

The committee recommends that the institute assemble statistics covering the sale and demand of the products of the industry; a wider utilization of the work which has been done by the advisory research and technical committees; a program showing the importance of improvement in the industry's products; and a program of public relations which will consider the value in the promotion of recognized standards and codes to both the contractors and the public.

Regarding customer and allied industry relations, the committee says: "Implementing a forward-looking public relations program requires this industry's closer collaboration with the Heating, Piping, and Air Conditioning Contractors National Association and other associations representing installers, as well as with groups representing allied industries."

On the subject of the financial outlook for the industry, the committee points out that "salability of our products during the coming postwar years is going to be determined more than ever by the price of the products to the ultimate consumer.

"The unprecedented national debt, the inordinately high if not almost crushing taxes in the postwar period certainly do not indicate that we will enjoy higher living standards. Consequently there will be a continuous demand for lower priced goods. All signs point in that direction."

The committee also calls attention to the fact that while production is of paramount importance now, distribution will become a major economic problem when the war is over.

Suggestions as to how economies in the postwar distribution of boilers and radiators may be effected are offered by the committee.

In addition to the report made by the postwar planning committee, reports were also made by the technical committee, the radiation standards committee, and the advisory research committee.

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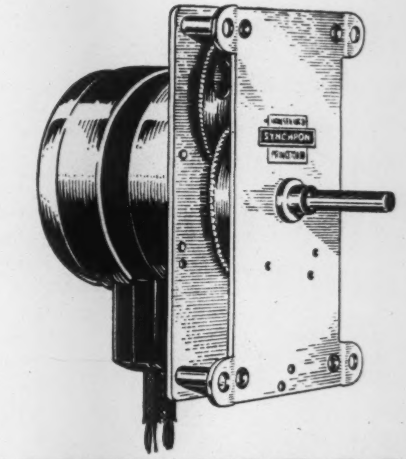

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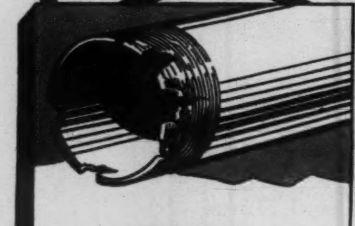

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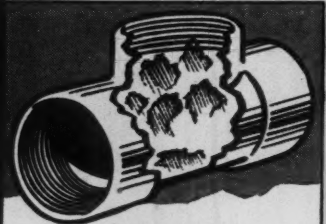

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J. P. Magos reported that the technical committee ha completed the first draft of a manual on the installatio of hot water heating systems. He said that the purpos of the manual is to make generally available throughou the industry some of the basic data developed as a resu of the I-B-R research program at the University of Illinoi

While the manual will be sponsored by the technical committee of the institute, Mr. Magos said that the two national associations of contractors will be invited to revie the manual before publication and to submit suggestion Mr. Magos pointed out that it is the earnest desire of th technical committee to work as closely as possible with th associations of contractors as well as manufacturers o heating specialties.

The first edition of the manual, he said, will cover onl the type of hot water heating system studied in the research house. Subsequently, as other types are studied, is proposed to expand the manual to cover all possibl types and combinations of systems.

Mr. Magos also explained that lower cost of equipmen greater compactness, and superior performance are som of the benefits which the committee believes will resu from the broad application of the findings of the researc program at the University of Illinois.

Continuing his report as chairman of the technical committee, he told the members of the institute about the meetings which the committee had in recent months with representatives of manufacturers of stokers and oil burner in an effort to develop better coordination between boiler and equipment for mechanical firing. He also reported o proposed commercial standards for hot water supply boilers

Reporting for the radiation standards committee, J. F McIntire recommended that manufacturers give furthe study to the reduction in the number of sizes of radiator both for the present and the postwar period. Mr. McIntir pointed out that 10 sizes of small tube radiators are no permitted as compared with approximately 50 sizes o large and small tube radiators previously manufactured

H. F. Randolph, a member of the advisory research committee, reported on a study of the cost of the heating o domestic water with a submerged heater made at the I-B-R research home during the summer of 1942. The study has revealed valuable data for computing the quantity of hot water available, the recovery rate, and fuel consumptio with various boiler water temperatures. Further studies are to be conducted in an effort to reduce standby losses.

Corrosion of Alloy Steels by High Temperature Steam

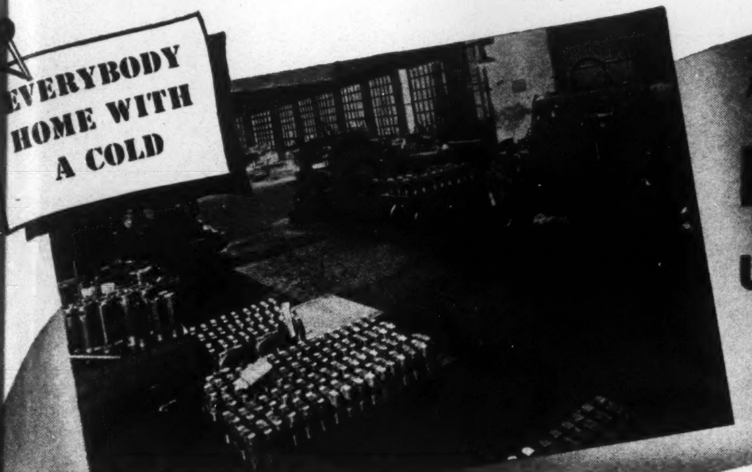
[The Corrosion of Alloy Steels by High Temperature Steam, by G. A. Hawkins, J. T. Agnew, and H. L. Solberg all of Purdue University, presented at the annual meeting of the American Society of Mechanical Engineers.]

Greatly increased efficiency in steam power plants will be made possible by the development of corrosion resisting alloys, according to this paper. Experiments at Purdue over a period of several years have shown that increased chromium content in alloy steels affords greater resistance to corrosion, thus permitting steam generation at much higher temperatures. "Steel containing 12 per cent of chromium," the paper states, "does not show serious corrosion at temperatures below 1500 F. . . . Steels containing more than 18 per cent of chromium were practically unaffected by 1800 F steam." Modern power plants generate steam at slightly below 1000 deg, the authors pointed out.

Fluid Flow Through Two Orifices in Series

[Fluid Flow Through Two Orifices in Series—II, by Milton C. Stuart, Lehigh University, and D. Robert Yarnall, Yarnall-Waring Co., presented at the annual meeting of the American Society of Mechanical Engineers.]

This is the second of a series of papers on the characteristics of fluid flow through two orifices in series. The first paper presented a theoretical analysis of the flow of water and steam through two orifices in series over a wide range of pressures and temperatures. This paper presents the



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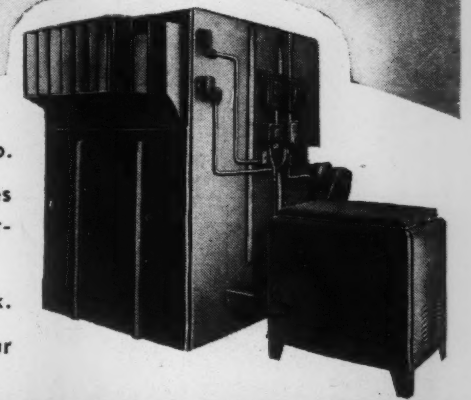

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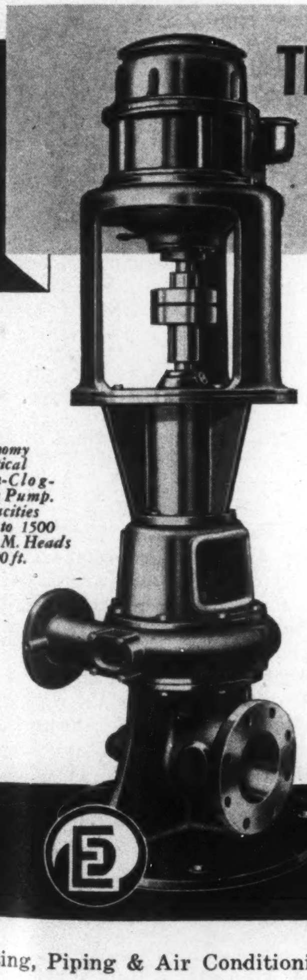

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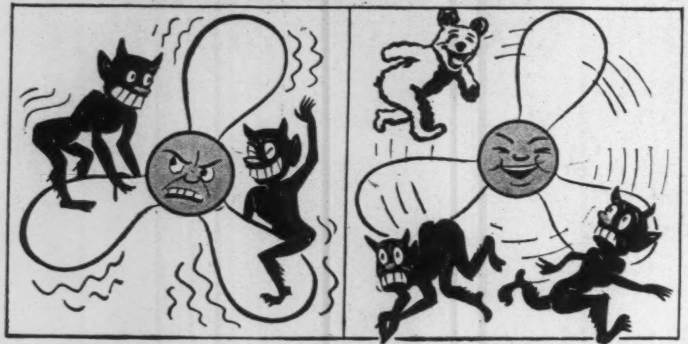

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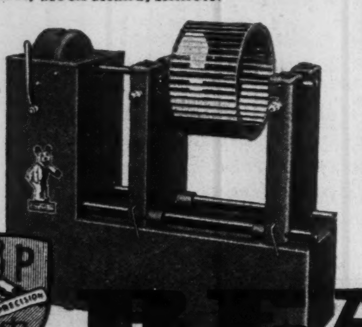

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results of experimental investigations on this subject using water at an initial pressure of 100 psi absolute and over a range of temperatures from room temperature to saturation temperature.

The principal data sought were the pressures established in the intermediate chamber between the two orifices, and especially the variations of this intermediate pressure with reference to the temperature of water supplied and the type of orifice. One of the most significant facts revealed by these researches is that under certain conditions of flow the fluid assumes a metastable state which greatly influences the characteristics of the process. Finally, a device responsive to the pressure variations obtained between two orifices in series constitutes a control element, useful, (among other things) to control flow in response to the state of the fluid supplied.

Notch Toughness Tests of Pipe Material

[Notch Toughness Tests of Carbon-Molybdenum Pipe Material, by W. F. Kinney, I. A. Rohrig, and H. S. Walker all of the Detroit Edison Co., presented at the annual meeting of the American Society of Mechanical Engineers.]

The development of materials for high temperature steam piping is of considerable importance in view of the upward trend in power plant operating temperatures. Chemical composition, steel melting practice, and heat treating procedure, and their effects upon physical properties and microstructure are important factors in appraising the probable behavior of a material in service. The metallurgist and power plant engineer are particularly interested in the influence of these factors upon notch toughness of th material.

Starting with the premise that there may be some correlation between notch toughness and performance of hig temperature pipe and that significance should be attached t the interpretation of notch toughness with respect to th behavior of carbon-molybdenum pipe material in powe plant service, the authors give details of an investigatio conducted in the Detroit Edison Co. laboratory on notc toughness testing. The specific problem studied was t determine the influence on the uniformity of test result and on the magnitude of average notch toughness values both at room temperature and at 925 F, of three variables (a) the type of specimen, (b) the heat of steel, and (c) th condition of the steel.

In connection with this testing program, a survey of th literature was conducted and inquiries were directed t various authorities regarding their experience with thi problem. The authors conclude that when the significanc of notch bar testing of carbon-molybdenum pipe materia is fully understood, it may be possible to select materia of the best quality for high temperature service on th basis of notch bar tests.

High Temperature Steam Corrosion Studies

[High Temperature Steam Corrosion Studies at Detroit by I. A. Rohrig, R. M. Van Duzer, Jr., and C. H. Fellows, al of the Detroit Edison Co., presented at the annual meeting of the American Society of Mechanical Engineers.]

A program was undertaken by the Detroit Edison Co. t determine the rate of corrosion and the relative corrosio resistance in an unstressed condition of various material that could be used in the construction of steam generator piping, and turbines. Specimens were exposed in a stea atmosphere at 380 psi and at temperatures of 925 F an 1100 F. The investigation required five years for completion; during that time 46 different materials were studied including nickel, nickel-copper alloys, chromium an chromium-nickel stainless steels, medium- and low- allo steels, carbon steels, and alloy cast iron. The tests wer conducted under plant operating conditions, and sample were exposed in superheated station steam for periods ranging from 4000 to 16,000 hr. Weight loss, hardness, an metallographic data were obtained after successive exposure periods for many of the samples. Trends in the corrosion rate were plotted for some of the materials.

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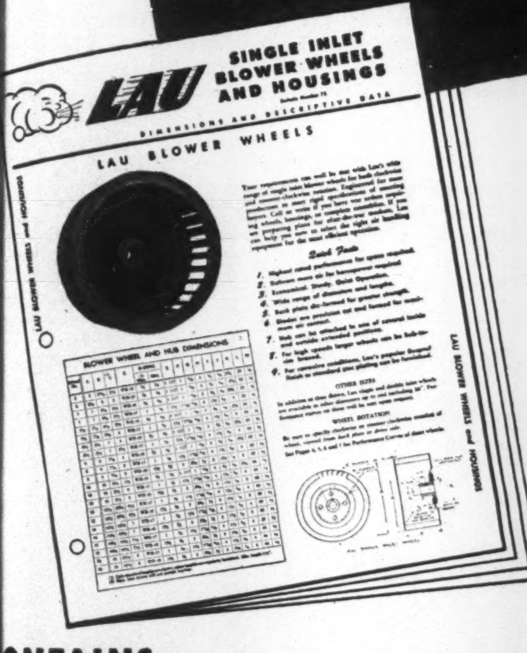
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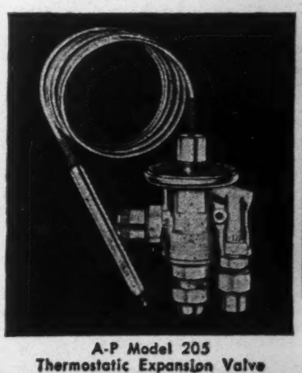
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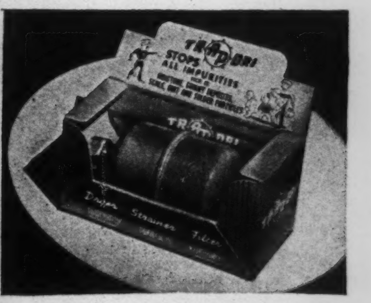

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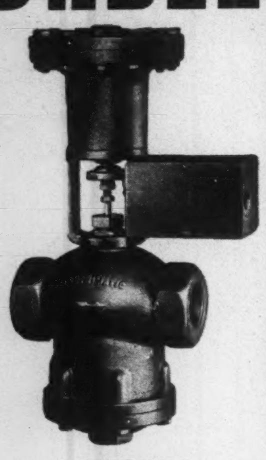
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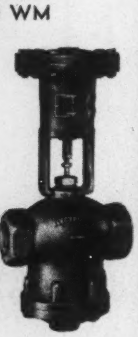
TYPE WR

The test results, reported in this paper, indicate that th weight loss of plain carbon steel exposed to 1100 F stea continues at a high rate, whereas the rate of loss of the al loyed materials decreases with time. The high chromium nickel and the 12-chromium stainless steels were the mos corrosion resistant. The corrosion rate of 0.50 molybdenu and 1.0 chromium steels compared favorably with that o steels containing 5 chromium.

Nonferrous materials were not as corrosion resistant i high temperature steam as the high alloy ferrous materials Materials which corroded rapidly at 1100 F corroded onl slightly at 925 F, and at this lower temperature there wa little difference between the rate of corrosion of plain car bon and alloy steels.

Empirical Equations and Nomography

Paradoxical though it may sound to call a book both brie and complete, nevertheless both these phrases apply t Empirical Equations and Nomography, by Dale S. Davis The first half of the book covers in considerable detail th fitting of empirical equations to data. The various type of equations which can be fitted to different plotted curve are classified in an orderly and systematic manner so tha the reader should have no difficulty in selecting a particula type of equation to fit his plotted points.

Furthermore, the second part of the book deals with th increasingly important subject of nomography—known t many as alignment charts. These charts, because they per mit a great deal of data, including several different vari ables to be presented in a simple form, have in the pas few years become increasingly popular. Mr. Davis' littl book shows how to draw alignment charts for many dif ferent types of equations. Here also the various types o alignment charts and their associated equations are classi fied and treated in a systematic manner, which makes i fairly easy for the user to select the type of alignmen chart and the method of drawing it.

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Can Be Connected Anywhere with a simple, quick wiring job. No location too remote. If you can bring a wire to it, you can heat it.

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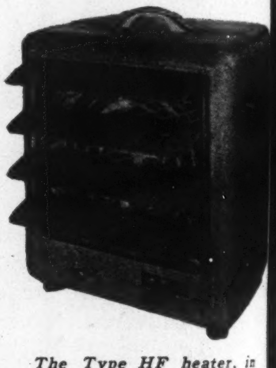
The Type HF heater, in four sizes — 1.5 to 4-kw. Other types up to 40-kw. for heating large areas. Chromalox heaters can be supplied with thermostatic control if desired. Available on proper priority.

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The final chapter in the book gives information on the nstruction of special slide rules. These special slide rules ve been used increasingly by manufacturers to help users lect their equipment. For those who want to construct ch special slide rules, this chapter will be highly informative.

Finally, and most important of all, this book is filled ith a large number of illustrative examples which should lp those who have difficulty in following abstract algebraic uations. These illustrative examples show in detail the rious steps required to fit either an empirical equation a given set of data or to construct an alignment chart om a given equation.

There are 200+ ix pp. The publisher is the McGraw-Hill ook Co., 330 W. 42nd St., New York, N. Y., and the price $2.50.—*W. G.*

ipe Plugs, Bushings, and Caps

For the convenience of users, a new American Standard s been approved which brings together in one document e various standards covering pipe plugs, pipe bushings, pe caps, and locknuts used in piping systems and other ping applications. The new combined standard is known the American Standard for Ferrous Plugs, Bushings, ocknuts, and Caps with Pipe Threads (B16.14-1943).

The sections of the new standard which cover pipe plugs ere originally published as American Standard B16e2-936. This 1936 standard was sponsored by the subcommittee of ASA sectional committee B16, which in preparg the standard made use, to a large extent, of material ssembled by the Manufacturers Standardization Society the Valve and Fittings Industry. The proposed standard as distributed by the ASA committee to a canvass of dustry and the resulting comments and criticisms were nsidered by the committee before the final draft was mpleted.

The American Standard dimensions for pipe bushings d locknuts were originally included in the American

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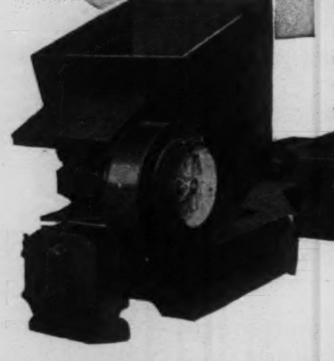

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Clinker type, or Side Dumping Grate, Hopper or Bin Feed Models.

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GRID condenser "fin" sections are made in one piece of high test cast iron—the same physical properties as cast iron radiators, and you know how long they last. In GRID heating sections there's nothing to become loose — nothing to develop leaks or breakdowns—and being made of similar metals there's no electrolysis to cause corrosion, with its resultant breakdowns and heating failures. GRID cast iron "fin" sections can be adapted for use as radiators, both open and convector type.

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Standard for 150 lb Malleable Iron Screwed Fittings (B16c-1939).

Originally the American Standard dimensions for pipe caps appeared both in the American Standard for 125 and 250 lb Cast Iron Screwed Fittings (B16d-1941) and in the American Standard for 150 lb Malleable Iron Screwed Fittings (B16c-1939).

Copies of American Standard B16.14-1943 may be obtained from the American Standards Association, 29 W. 39th St., New York 18, N. Y., for 40c.

Maintenance Arc Welding

A timely contribution to the literature of welding, Maintenance Arc Welding is a guide and reference for one of the most common and useful fields to which this modern process is applied. It is the second important book to be developed from the 1940-42 industrial progress award program of the James F. Lincoln Arc Welding Foundation. Comprising 25 of the most significant award papers in the program's maintenance classification, the information contained in this volume will be found particularly useful in keeping machinery and plants in operation despite critical shortages in materials and equipment.

This book is priced at 50c per copy postpaid anywhere in the United States, 75c elsewhere. Copies may be secured by writing the James F. Lincoln Arc Welding Foundation, P. O. Box 5728, Cleveland, Ohio. There are 233 pp., 6x9 in.

Feeder Voltage Regulator Standards

The National Electrical Manufacturers Association, 155 E. 44th St., New York, N. Y., recently published the new feeder voltage regulator standards, publication No. 43-86. This marks the first time that all of the standards of a national character having to do with feeder voltage regulators and step type voltage regulators have been published i one booklet.

Copies may be obtained from the NEMA for 75c.

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MEETINGS & CONVENTIONS

uels and Heating Course

Fuels and Heating Course, sponsored by the Illinois Fuel Merchants Association, Chicago, and the department of mining and metallurgical engineering of the University of Illinois, Urbana, to provide training for heating and ventilating engineers, coal merchants, and service men in ombustion and utilization of coal. Sessions to be offered uring February and March (the course started January 3) include the ABC's of combustion; characteristics of oals; stoker coal; stoker coal service problems; trends in oal sizing, preparation, and use; trouble shooting, fuel conservation, modernization, and firing methods; and education of the fuel user and postwar activities. Sessions are held in Freeport, Waukegan, Downers Grove, Wheaton, Elgin, Quincy, Decatur, Ottawa, Joliet, and Aurora. Full information is available from H. C. Rountree, supervisor, engineering extension, University of Illinois, Urbana, Ill.

ower Conference

Midwest Power Conference, seventh annual conference, April 13-14, Palmer House, Chicago, Ill. Theme of the meeting is to be "power brings victory," and it is sponsored by Illinois Institute of Technology, with other schools and various societies cooperating. Conference director is Stanton E. Winston, Illinois Tech., 3300 Federal St., Chicago, Ill.

oundrymen's Congress

American Foundrymen's Association, third war production foundry congress, week of April 25, Memorial Auditorium, Buffalo, N. Y. There will be exhibit booths for conference and consultation, and displays of models, products,

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Stucco-like finish requires no maintenance. A gallon covers about 30 feet of ½" pipe. Dries in 24 hours. Comes in 1, 5 and 55 gallon drums.

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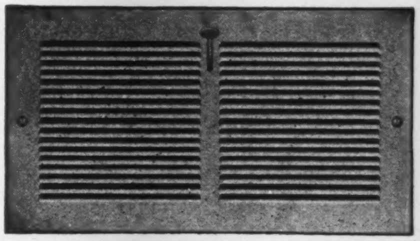

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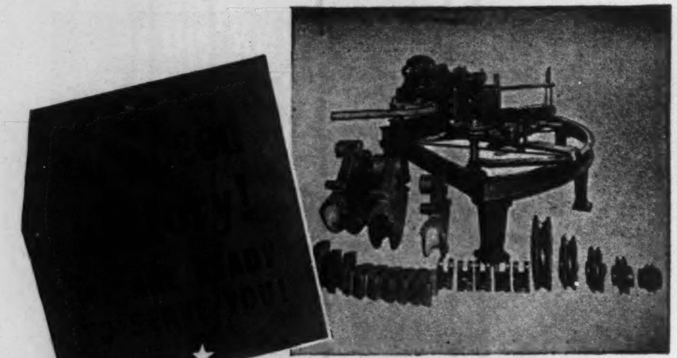

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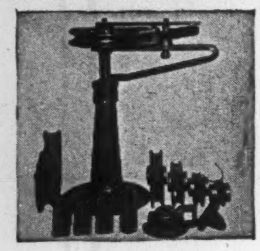

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Ventilation that does the job comes first with Allen. Close on the heels of that consideration comes lowered cost to the buyer. Only when we click on both are we satisfied, because only then dc we know we've done a job.

Basically better ventilation engineering has enabled Allen to furnish industry with more than four thousand Allen Type "H" Roof Fans at an average saving of $62.50 per unit over the nearest comparable equipment—more than a quarter million dollars.

The explanation is simple. Allen patents cover the use of dampers balanced in the effluent air stream—open when the fan is running, closed automatically when power is off. This is in contrast to construction used by several other manufacturers wherein mechanical, motor-operated dampers are mandatory and up the cost.

Approximately 400 of these Allen units top the huge Willow Run Bomber Plant alone. Allen has an answer for your ventilation problem, too, whether it's ordinary or extraordinary. Let's talk it over. *The Allen Corporation, 9751 Erwin Avenue, Detroit 13, Michigan.*

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ENGINEERED VENTILATION FOR INDUSTRY

and equipment. Secretary of the AFA is R. E. Kenned 222 W. Adams St., Chicago, Ill.

Mechanical Engineers

American Society of Mechanical Engineers, semi-annu meeting, June 19-22, Hotel William Penn, Pittsburgh, P Headquarters office of the ASME is at 29 W. 39th St New York, N. Y.

District Heating Association

National District Heating Association, 35th annual mee ing, June 20-21, Hotel William Penn, Pittsburgh, Pa. Joh F. Collins, Jr., 827 N. Euclid Ave., Pittsburgh, is secretary treasurer of the NDHA.

Building Codes—An Essential Tool in Urban Development

The construction and civic development department o the Chamber of Commerce of the United States, Washington, D. C., published recently a 16 p. pamphlet, Buildin Codes—An Essential Tool in Urban Development. Poin ing out that private building construction sponsored by pr vate enterprise or private capital will be stimulated or r tarded in the postwar period by the rules, regulations, an restrictions of building codes which govern such constru tion in urban areas, the bulletin says that it is highly de sirable that handicaps imposed by old and obsolete regula tions be eliminated, and that codes in those cities operatin under old ordinances be modernized.

Topics discussed include building codes and the publi safety, building codes and quality of buildings, demolitio of substandard buildings, building codes and blighted areas the greater code flexibility which redevelopment require economic effects of building codes, modernization of cod provisions for new materials, coordination of codes, thei administration, and the new responsibilities for codes whic war creates.

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EQUIPMENT DEVELOPMENTS

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"Thinking" Valve for Air Conditioning Control

No. 2578*—Patent No. 2,342,328 has been issued to Dr. Willis H. Carrier, chairman of the board of Carrier Corp., 302 S. Geddes St., Syracuse, N. Y., covering a "thinking" valve whose potentialities in the air conditioning field "indicate a major change in postwar cooling and heating of hotels, office buildings, and other large structures."

The valve anticipates the requirements of any room by admitting to an air conditioning unit, cold or hot fluids in exactly the desired amounts automatically, and with no need for change in setting throughout the year. Once it is adjusted to give desired comfort during summer and winter seasons, the valve will assure proper compensation for changes in weather conditions or for variations in requirements of the air conditioning system arising from the number of people in the room, according to the manufacturer.

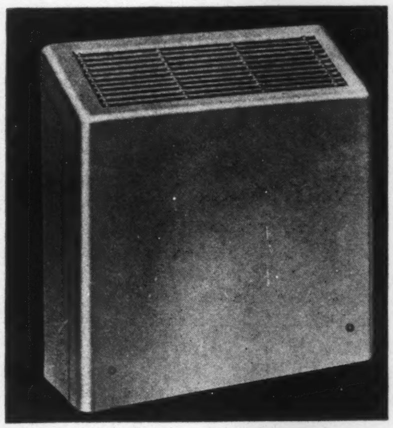
Although specially designed for use in connection with comfort air conditioning the valve will also fill a need in a large number of industries where heating and cooling liquids are required at different times and in varying amounts.

By this device, the same control apparatus is adapted to admit cold or refrigerated liquid in one flow circuit under conditions requiring cooling, and will admit warm or heated liquid in another flow circuit under conditions requiring heating, both circuits feeding to any desired air conditioning or industrial processing units.

Convector for Postwar Institutional Use

No. 2579—A new copper convector designed specifically for postwar institutional application has been announced by the Modine Mfg. Co., 1772 Racine St., Racine, Wis.

Through experience, the manufacturer has found that engineers usually specify convectors of extra weight and strength and with special design features for institutional heating. Accordingly, the most frequently specified institutional specials have been incorporated in a special, heavy duty convector which will be available at a cost only moderately in excess of standard equipment. Features include heavier gage enclosure fronts and backs, lock type, tamperproof dampers and front attachments operated by means of a special key, and a new heavy duty grille.

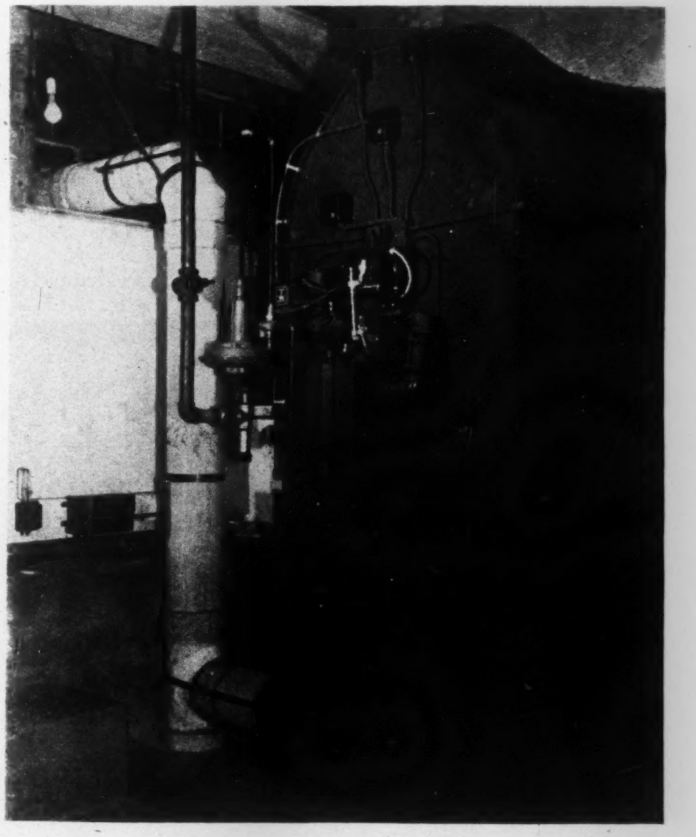


These grilles have 80 per cent free area, meeting the requirements for low air resistance, says the maker. Grilles are fabricated from continuous 16 ga steel bars and ¼ in. diameter steel rods. All joints are copper brazed. Bars are spaced ⅜ in. apart, to discourage stuffing refuse into the enclosure.

Enclosures are available in recessed and wall cabinet types.

Control for Gas Burning Direct Fired Air Heaters

No. 2580—A new method of control for gas burning direct fired warm air heaters manufactured by the Dravo Corp., has just been announced. The new method is in reality a dual control by means of which at least 25 per cent capacity of the heater is worked on a straight "on and off" basis and the remainder modulated to fit the heat requirements, according to the announcement.



This type of control used under ordinary conditions insures practically continuous operation of the heater at at least 25 per cent capacity, in this way reducing starting and stopping with resulting economy in fuel and uniformity of heat output, it is said. The modulated control as described herein is also useful for tempering large volumes of ventilating air frequently used in connection with heating systems of this type.

Heating, Piping & Air Conditioning, [4-44]
6 N. Michigan Ave., Chicago 2, Ill.

Please ask the manufacturers to send me more information about the equipment mentioned under the following reference numbers in Equipment Developments and Recent Trade Literature.

(Circle each number in which you are interested)

2578 2579 2580 2581 2582 2583 2584 2585 2586
4666 4667 4668 4669 4670 4671 4672 4673 4674 4675
4676 4677 4678 4679 4680 4681 4682

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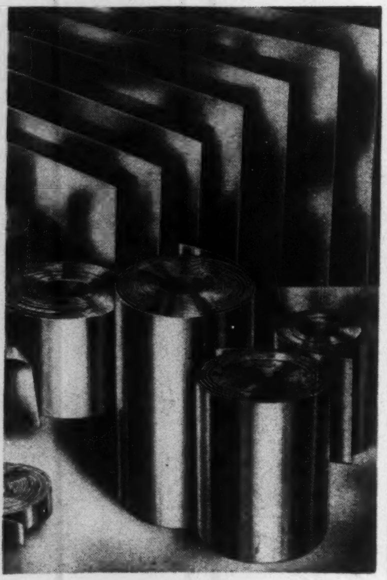

Hussey is still working at top speed to help win this war as quickly as possible. Meanwhile, Hussey research and engineering skill—working "overtime" to meet war pressure demands has produced several outstanding developments and improvements in manufacturing Copper and Copper products.

These new improvements will mean greater production economies, closer quality-precision-control that will prove most advantageous to you, in your use of Copper in even more diversified applications in the post war period.

Hussey engineers welcome the opportunity of cooperating with you in post war planning.

C. G. HUSSEY & COMPANY
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Air Heated While Cooled Protects Sensitive Instruments

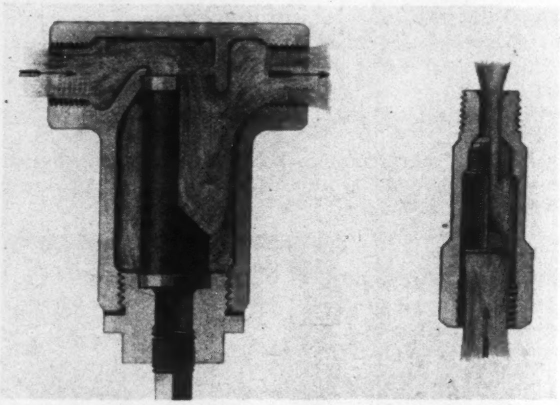
No. 2581—Air conditioning which heats while it cools now protects sensitive radio equipment in battle areas and may point the way to a new type of controlled indoor weather in peacetime, engineers of the York Corp., Roosevelt Ave., York, Pa., report. The system makes practical a constant and accurately balanced ratio of temperature and humidity. Used by both the Army and Navy, the small self-contained unit has helped solve the problem of high tropical humidity in shelters housing critical instruments.

By reheating the air slightly after it has been chilled sufficiently to remove all unwanted moisture, the equipment is able to maintain a constant humidity of 50 per cent in the conditioned space although the surrounding climate may frequently reach the moisture saturation point, it is stated. It prevents temperature from falling too low by putting back automatically into the conditioned space some of the heat units which it has taken from the air.

It is frequently impossible for ordinary air conditioning to provide complete comfort when humidity rises excessively and under such conditions occupants are apt to experience either a feeling of clamminess or unusual chill. For example, on a day when the mercury is only 70 F but the humidity stands at 90 F or over, excessive moisture can be removed from the air only by lowering the temperature to such a degree that it becomes uncomfortably cool, says the manufacturer. The condenser reheat unit solves this problem by tapping off some of the hot refrigerant gases after they have left the compressor and are on their way to discharge their load of heat units through a condenser. Instead of flowing directly to the condenser, the hot gases are passed through another coil which heats the air as it leaves the cooling mechanism. Automatic controls regulate the whole operation.

New Strainers

No. 2582—Improvements in both design and construction are featured in two types of liquid strainers developed by Spraying Systems Co., 4031 W. Lake St., Chicago 24, Ill.



For installations involving the use of several nozzles on a single feed line, the type "TW" (left) offers unique advantages, says the manufacturer. Design of the strainer results in an extremely large open screen area in relation to the pipe area of the line, so that it may easily handle the full capacity of a line supplying several nozzles. Consequently, it permits freer flow of the liquid and does not require cleaning as often as ordinary strainers. A blowout plug makes the unit easy to flush and clean without removal from the line.

In the type "Q" line strainer (right) a highly effective strainer for single nozzle installation is offered, says the maker. Maximum capacity of this strainer is 1 gpm of water, brine, oil, and liquids of similar viscosity. The screen in this strainer is removable to facilitate cleaning.

Cast Iron Heating Sections

No. 2583—A patent on the cast iron fin heating section used in their unit heaters, blast coils, and radiation equip-

• EQUIPMENT DEVELOPMENTS •

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High Temperature Piping Insulated on Inside

No. 2558—When chrome and nickel were placed on the critical materials list, the high pressure-high temperature piping industry was faced with the problem of finding some substitute method of fabricating pipe to meet specific conditions. After two years of experimental field work, combining engineering experience and the electric arc welding process, a method was developed by Baldwin-Hill Co., 531 Klagg Ave., Trenton 2, N. J., of insulating standard steel pipe to carry gaseous materials at pressures and temperatures well above the normal range, thus eliminating or materially reducing the need for chrome, molybdenum, or chrome-nickel alloys in pipe of this category, according to details reported by The Lincoln Electric Co., 12818 Coit Rd., Cleveland 1, Ohio.

Heating, Piping & Air Conditioning, [3-44]
6 N. Michigan Ave., Chicago 2, Ill.

Please ask the manufacturers to send me more information about the equipment mentioned under the following reference numbers in Equipment Developments and Recent Trade Literature.

(Circle each number in which you are interested)

2558 2559 2560 2561 2562 2563 2564 2565 2566 2567
2568 2569 2570 2571 2572 2573 2574 2575 2576 2577
4644 4645 4646 4647 4648 4649 4650 4651 4652 4653
4654 4655 4656 4657 4658 4659 4660 4661 4662 4663
4664 4665

Name.............................. Title............

Company ....

Address ....

City.............................. State............

The theory of the method is simple. Carbon steel pipe is a satisfactory medium for conducting pressure as long as elevated temperatures are not present. Above 650 F, however, the physical properties of carbon steel pipe change considerably and at 1000 F allowable working stresses must be radically reduced. The new procedure, by reducing pipe wall temperatures below 650 F, makes possible the use of standard sizes of standard steel pipe for high pressure-high temperature service.

The method used to accomplish these results is as revolu-

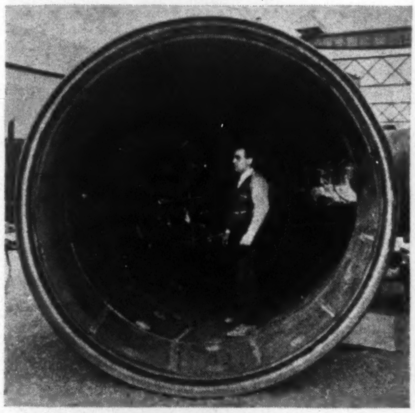


Fig. 1—Completed pipe section of the larger size, insulated by unique fabricating method made possible by arc welding

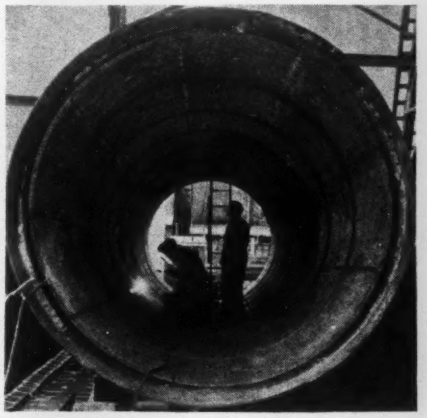


Fig. 2—Carbon steel panels being welded in place after installation has been made

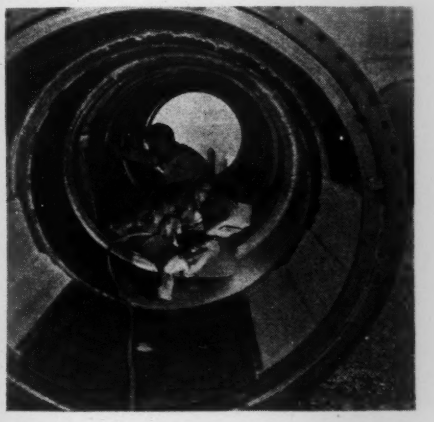


Fig. 3—Three stages of insulated pipe construction. Insulated rings are properly spaced inside pipe. Worker (rear) is placing insulation bats between rings. Operator (foreground) is welding panel to rings

Fig. 4—Pipe liner panel with anchor hole in center and anchoring thimble (foreground) before installed

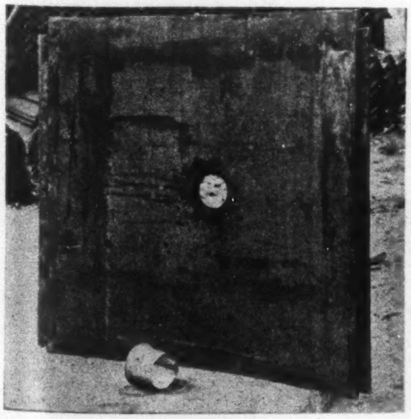


Fig. 5—Cartridge (right) before insulation has been added, and showing reinforcing rings welded to inner lining. Cartridge at left has insulation and steel jacket in place

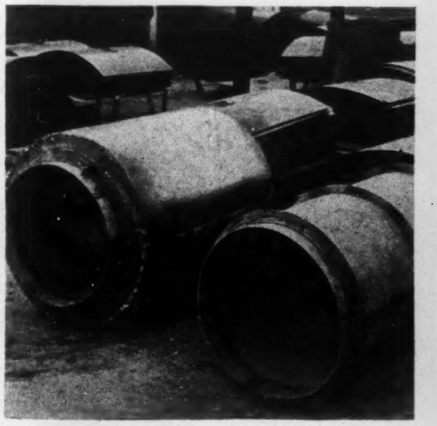
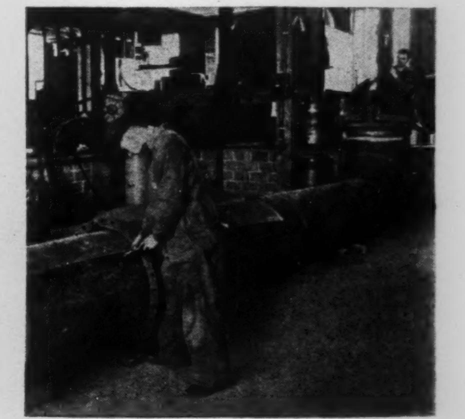


Fig. 6—Cartridge type insulation liner being pulled into place inside pipe



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b Cold Pipe Covering and Lagging
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tionary as it is simple. The insulation is placed on the inside of the pipe instead of the outside.

In the larger size pipe, 36 in. to 100 in. diameter, unequal leg angles (2 in. by 1½ in. by 3/16 in. or ¼ in.) are rolled into a ring to conform to the radius required. These angle rings are then overlapped, unequal to equal leg, and the area between the vertical legs is then filled with high temperature insulating material, temporarily held in place by wire mesh. These rings are placed at 3 ft intervals inside the main pipe and the entire inside surface is packed with laminated sheets of insulation to a thickness exceeding the leg height of the angle rings. The inside liner is formed by welding rolled steel panels (3 ft by 3 ft by ¼ in. or 5/16 in.) to the angle rings. When all panels have been welded in place, the result is a continuous pipe surface, complete with expansion joints, floating in insulating material inside the main pipe. A 3/16 in. by 3 in. lap ring is welded on the upstream side of the flow to close the opening between rings and complete the liner surface. Below 1200 F, the liner panels are mild steel; above 1200 F, 11-13 chrome or 18-8 chrome nickel is used.

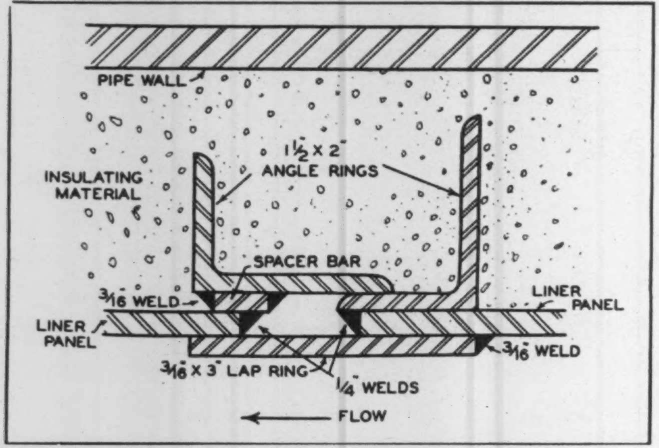

Fig. 7—Detail of inside liner joint in insulated pipe design

To keep this liner from shifting in the main pipe, a 3 7/16 in. hole is drilled in the exact center of each panel (except where joint interference is encountered) and a forged ring is then welded around this hole on the convex surface, or insulating side, prior to assembling in the main pipe. The insulation between the liner and pipe is reamed out at this opening and a flanged, 12 ga 18-8 thimble is inserted and welded to the main pipe only. The inside area of the thimble is then stuffed with insulation and the disc which was originally cut from the liner, to permit insertion of the thimble, is replaced and butt welded, closing the hole.

Expansion of the liner is accommodated by overlapping the two angle rings to which the panels are welded. This materially reduces external expansion joints and the concurrent engineering detail normally necessary to meet expansion conditions in large pipes.

In the smaller pipe, 36 in. diameter and under, an insulated cartridge is prefabricated by rolling alloy sheet into a cylinder, reinforced by tack welding 1½ in. by 3/16 in. stiffener rings around the outside diameter at regular intervals. The insulation is placed on the outside of this reinforced liner, and a 22 ga mild steel sheet jacket is placed over the whole to retain the insulating material. The completed cartridge is then pulled into the pipe. Internal expansion is handled by slip joints between cartridges.

To date, this process has been most applicable in synthetic rubber and high octane gas refineries. It furnishes a graphic illustration where invention, by recourse to arc welding, preceded necessity, successfully handling alloy shortages, both to shorten time of delivery of synthetic rubber and increase the volume of supply of aviation gasoline.

A typical installation of this type of piping is in a butadiene plant, in which plain carbon steel pipe, insulated and

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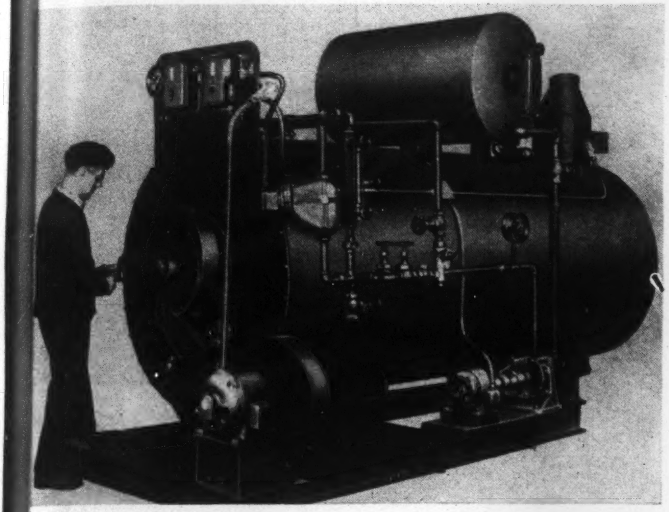
ined, is carrying superheated steam at 1400 F, 5 to 40 psi ressure, with a velocity of 200 to 500 fps.

At one refinery this type of pipe carries a catalyst in ilute gaseous suspension, at a temperature of 1000 F. Intallations have been made or designs completed to enable ipe to handle pressures up to 300 psi, temperatures to 500 F, and sizes to 100 in. diameter.

ackaged Steam Generators

No. 2559—A compact steam boiler, developed by Orr & embower, Inc., Box 1138, Reading, Pa., embodies several ew features. Known as the "Powermaster," it is now used by the Army in mobile laundry units, by the Navy, and by Pan American Airways advance bases for many special purposes. The boiler develops 100 psi pressure from 60 deg water in 18 min or less, the maker states. This packaged power plant will be of especial value in dehydration and other food processing plants, as well as in laundries, dairies, and in all industries where quick steam is needed for processing, power, or heating.



Features of the boiler which insure fast, effective, and low cost steam production, as described by the manufacturer, are:

1) Its three pass construction which provides quick steaming, high efficiency, and long boiler life. The unit requires little cleaning, but when cleaning is necessary, removing the back plate permits access to the tubes.

2) Its special oil burner which gives a rotary motion to the flame. As a result of this motion, the flame "hugs" the walls of the combustion chamber, thereby assuring longer gas travel and greater heat transmission.

3) Its builtin condensate return system which provides compactness and easy installation. Return condensate or water direct from the supply line or both may be utilized as feedwater.

Electric Eye Warns of Gases and Vapors

No. 2560—A vigilant "safety patrolman," with an electric eye that can see the shadows of many otherwise invisible gases and vapors, has been developed by E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., to warn of dangerous concentrations of these compounds in the atmosphere of manufacturing plants.

Known as an ultraviolet photometer, the instrument is fast and simple and is so sensitive that it can detect one part of carbon disulfide, for example, in a million parts of air, it is said. Similarly faint whiffs of other volatile compounds are quickly detected. The instrument can take quick grab samples or run continuous samples and give direct and instantaneous readings.

Operation is based on the phenomenon of light absorption by gases. Most gases, including the constituents of the air itself, absorb light of some particular wave length, in effect casting a shadow where that particular wave length

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light would otherwise have fallen. In a spectrum that shadow is known as an absorption line.

Carbon disulfide, for example, strongly absorbs light having a wave length of 3132 Angstrom units. Light of this wave length is in the ultraviolet range, invisible to the human eye but not to the electric eye, which in the case of the analyzer is a sodium photocell.

The carbon disulfide analyzer is so constructed that the air to be analyzed is pumped through several small chambers, which filter out dust, oil, and moisture, and thence into a pair of parallel tubes, about 31 in. long. The contaminated air runs into the first tube and then through a canister of activated charcoal which removes the carbon disulfide, and passes purified air into the second tube. In this way there may be a continuous comparison of the purified with the contaminated air and minute differences may be detected.

Rays of invisible ultraviolet light from a mercury lamp pass through the two tubes and fall upon a photocell mounted at the opposite end of each tube. The optical system, including filters, has been so selected that about 60 per cent of the photometric response of the electric eye is due to light of 3132 Angstrom units in wave length, the light which carbon disulfide absorbs. No other atmospheric element has been found in plants where this instrument is used that absorbs either this band of light or the 3650 Angstrom unit band, which accounts for most of the remainder of the photocell's response. Therefore, when the analyzer "bats its electric eye" the operator knows it has seen the "shadow" of carbon disulfide. One part of this vapor in a million parts of air will produce an absorption of 0.02 of 1 per cent, which is detectable by the instrument.

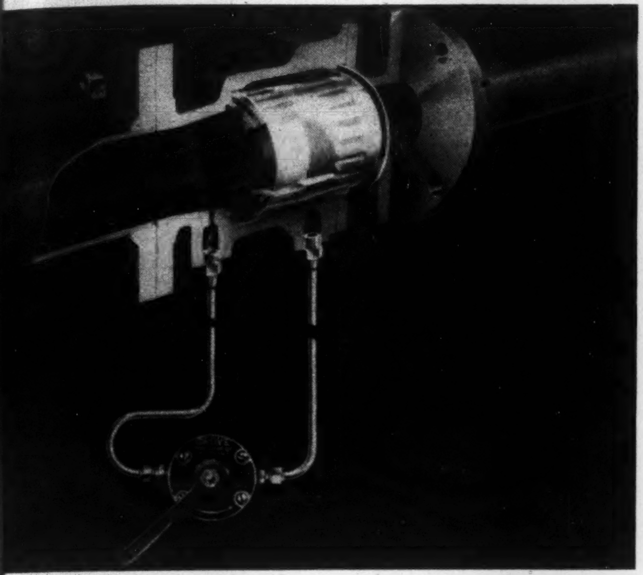
As an example of how the analyzer is used, a test is cited in which 61 readings were made during the 9 min required to open, dump, and clean out a large vessel in which material was treated with carbon disulfide. During most of the operation the concentration of gas remained below 20 ppm and older methods of analysis, which could give only the average for this entire time interval, would show no danger points. However, the electric eye revealed that the concentration rose to 60 ppm at one moment and to 40 at another. The ventilating equipment was therefore modified in order to eliminate these peaks.

Hydraulic Remote Control Valve

No. 2561—The "Flexflo" remote control valve represents a departure from conventional types of valves in design, construction, and operation, says the manufacturer, Grove Regulator Co., 1190 67th St., Oakland, Calif. Identified as an "expansible tube type" valve, it operates by manual or automatic remote control on the hydraulic principle of balanced and unbalanced fluid line pressure. Virtually no external force is required.

Designed for cold fluid service, these valves are said to be especially suited for handling water, salt water, chemical solutions, oil, gases, and air. Due to the fact that they utilize just one non-metallic operating part they are resistant to corrosion and erosion as well as electrolytic action and are automatically self-compensating for wear.

Their simplified assembly consists of but four parts, the valve body, the flange head, a slotted pipe-like core with a solid barrier in the center, and a cylindrical flexible tube. This resilient tube is stretched tightly over the core. Both the tube and core slip into the valve body as a unit and are held in place by the bolted flange head. The flanged ends of the tube serve as a leakproof gasket sealing off an encircling pressure chamber from the flow stream. Existing fluid pressure in the line forces the tube to expand against the inner wall surface of the encasing valve body, thereby opening the valve and permitting a streamline flow. This occurs when the remote control valve is closed. By opening the small remote control valve, line pressure is diverted into the actuating chamber and establishes a pressure balance on the inner and outer walls of the expansible tube. The tube then "flexes" closed over the surface of the core. Static line pressure then maintains a positive shutoff of the valve.



Several of the valves can be controlled from a central remote control station. This valve can be operated hydraulically or pneumatically by various systems such as manual, electro-solenoid, mechanical, or automatic remote control.

Portable, Self-Powered Ventilator

No. 2562—A portable, self-powered ventilator has been developed by the Herman Nelson Corp., 1824 Third Ave., Moline, Ill., and was primarily designed for use in cooling the interior of aircraft during repair work in hot climates. Several other important applications have been evolved by the necessities of war, and many more civilian uses are anticipated.

The unit consists of a pressure type fan driven by a small gasoline engine or electric motor connected to a collapsible canvas duct through which the air is propelled to the area to be ventilated. Air delivery at 3400 rpm is 4500 cfm without the duct assembly attached, and 4000 cfm with the duct assembly attached,

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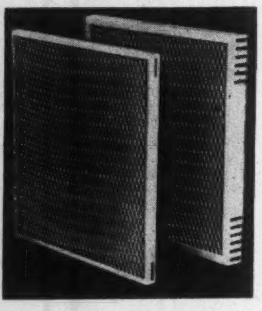
says the manufacturer. The whole unit, mounted on wheels, is only 24⅝ in. high; weighing only 87 lb, it can be wheeled easily by one man and lifted into the interior of a plane when it is desirable to use the ventilator without the duct or to ventilate a distant compartment.

In addition to its use on aircraft, where it either blows outdoor air into the plane or exhausts hot air from the interior, the unit has been found useful for drying out the bilges, engine rooms, and double bottoms on ships, for driving out gases and fumes from confined spaces and, without the duct, as a man cooler.

Three Impingement Type Filters

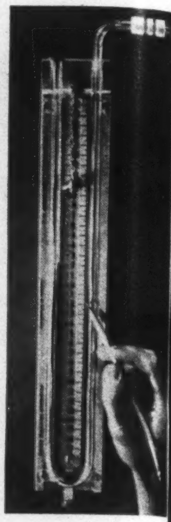
No. 2563—Three impingement type filters announced by Air Devices, Inc., 17 E. 42nd St., New York 17, N. Y., have a special expanded metal filter mesh design which results in lower initial resistance and high efficiency, even when heavily dust laden, according to the manufacturer. Vents in the frame aid in quick cleaning and thorough draining.



The "Badger" air filter, available in 1 and 2 in. thicknesses and in many sizes ranging from 100 to 600 sq in., is specially designed for ventilation and air conditioning service and other applications where high efficiency, large dust holding capacity, and low static pressures are required. The "Permo-Aire" filter, recommended for extra heavy duty and industrial air cleaning services, is supplied in 2 and 4 in. thickness with areas from 100 to 1200 sq in. The "Permo-Aire" grease filter, for kitchen and galley ventilation, removes grease from kitchen fumes, avoids danger of grease fires, protects mechanical equipment, and insures better sanitation.

Filter holding frames, with "Slip-Groove" assembly an spring locking features for savings in assembly and clea ing time, are available in many standard sizes and shape for applications where large filtering capacities in mini mum space are required.

Manometers Use Plastic Tubing



No. 2564—Shatterproof "Tenite" plastic replaces glass tubing to make manometers which are rugged, yet accurate and easy to read. A demand for unbreakable gages, both portable and stationary, to check pressures in boilers and air conditioning units led to the use of the plastic tubing. The tubing is seamless and easily bent into the desired position. The ends are threaded for screw caps. L-connectors of slightly smaller tubing are a convenient means of venting the gages to atmosphere and opening them for the addition of fluid. These are tapered and pressed in to make leakproof connections. The fluids used are water, oil, and mercury.

These manometers are manufactured by F. W. Dwyer Mfg. Co., 565 W. Washington Blvd., Chicago 6, Ill., with tubing extruded by Sandee Mfg. Co. The plastic used is a cellulose acetate butyrate product of Tennessee Eastman Corp., Kingsport, Tenn.

Viscous Panel Filter

No. 2565—Designated as "Model DPV," a new air filte is offered primarily for application in ventilation and ai conditioning systems where filter resistance up to approxi

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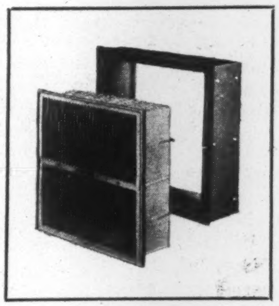
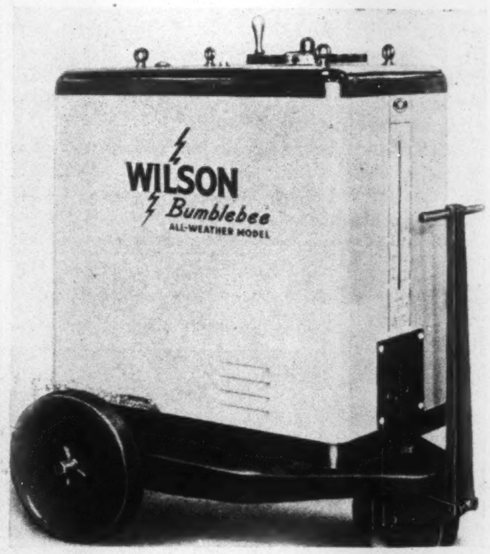


mately 0.6 in. of water is permissible.

The filtering medium consists of a series of crimped layers of galvanized screen cloth and woven copper mesh, coated with filter oil. The medium is so arranged within the metal cell that it provides extremely large dirt holding capacity, thus requiring a minimum of servicing, says the manufacturer, the Dollinger Corp., 11 Centre Park, Rochester N. Y.

The cells are made up of 16 ga steel finished with a corrosion resisting paint, and are fitted with handles and cam-type locking latches which hold the cell tightly in place in its supporting frame, thus sealing the unit against air leakage. The supporting frames are so designed and drilled that they can be riveted together to form a flat bank, or, by the addition of angles, a series of "V's," so that a maximum of filter capacity can be installed for any given space.

All-Weather Welding Machines

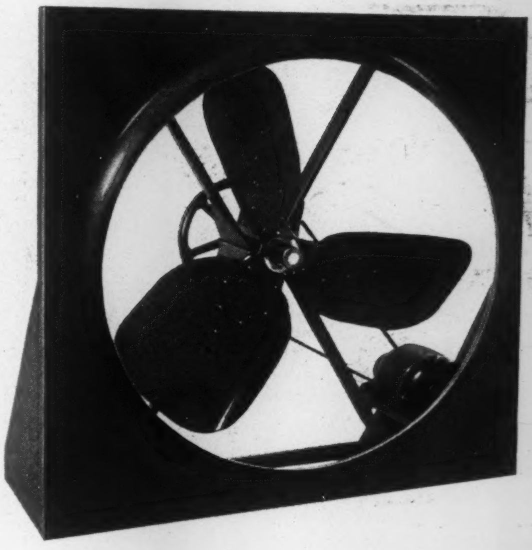


No. 2566—"Bumblebee" a-c welders are now available in "all-weather" models of 300 and 500 amp capacities. These machines are similar to the standard models, except that they have special moistureproof insulation throughout, and all parts are protected by a heavy coating of moisture-proof paint. The outer case is finished in a durable weather resisting enamel and has gaskets and louvers designed to prevent entrance of rain. In addition, the unit is equipped with a low voltage contactor which automatically holds the open circuit voltage at approximately 40 volts. When the operator strikes the arc, the low voltage contactor closes instantly and the transformer's performance thereafter equals that of machines not similarly equipped, says the manufacturer, Wilson Welder & Metals Co., Inc., 60 E. 42nd St., New York, N. Y. When the arc is extinguished, this device immediately reduces the voltage back to 40 volts.

Improved Test Chamber

No. 2567—An improved test chamber for high and low temperatures has been announced by American Coils, Inc., 25-27 Lexington St., Newark, N. J. When specially ordered, the improved machine, which embodies all the features of the standard "Amcoil" cabinets, may be obtained with the added advantage of four individually operated plugs in the lower panel of the door which permit ready access to the interior of the testing chamber.

A turn of the handle opens the plug. The hand may be inserted through an insulated passage and the position of the part being tested can be adjusted. In the case of a regulating instrument being tested, its reading may be changed, so that the test can be continued without removing it from the cabinet, or disturbing the other pieces being tested. This eliminates the necessity for opening the whole



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42"	12,600	1/3
48"	15,050	1/2
48"	18,000	3/4

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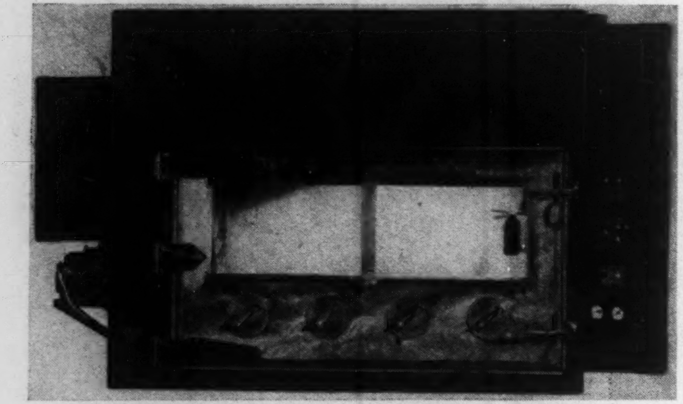

door and thus endangering the accuracy of the test on other parts in the chamber.

The machine is automatic, and by precision mechanism assures scientific control of all temperatures. It can produce whatever temperature is desired between minus 70 C to 158.8 C, and it can maintain the temperature at any level so that actual service conditions may be created, says the manufacturer.

Coated Aluminum-Bronze Electrode

No. 2568—A new coated aluminum-bronze electrode ("Airco" No. 100), announced by Air Reduction Sales Co., 60 E. 42nd St., New York 17, N. Y., is a shielded arc electrode, and can also be used as filler rod in carbon arc welding. It will produce welding deposits of great strength and ductility, combined with desirable resistance to corrosion, says the manufacturer.

Used for welding most bronzes, malleable and cast iron, or steel, it has other specific applications for which it is especially suited, such as welding manganese bronze conforming to federal specifications QQ-B-726b, or Navy specifications 49-B-3e for marine propellers and other parts. It can also be used for welding dissimilar metals, such as cast iron to brass, steel to malleable iron, or the joining of any two metals which are weldable with aluminum-bronze.

New Check Valve

No. 2569**—A check valve "made from a minimum of critical materials" has been introduced by Electrol Inc., Kingston, N. Y. It is entirely a screw machine product consisting of only three parts. Since it uses no hardened steel and requires no grinding or honing equipment, it conserves critical war materials and machines, says the manufacturer.

Navigation Trainer Air Conditioned

No. 2570—An important war job air conditioning is doing is insuring the accuracy of flight devices used in the training of pilots. Like the widely used Link trainer, the celestial navigation tower, a more recent and less well known training device, is dependent for its proper functioning and operation on controlled temperature and humidity. At an Army air base, this job is performed by a specially designed Carrier Corp. air conditioning system composed of three package units.

The trainer, a plane fuselage large enough to accommodate the entire crew of a bomber, is designed to duplicate exactly flying conditions and problems encountered in the air on actual bombing missions. Bombardier, pilot, radio man, and navigator go through their paces and perform all the duties of actual low altitude and precision bombings without leaving the ground.

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Featuring flexibility to meet various firebox shapes and sizes at various gas pressures, and low draft loss. Full automatic controls that operate properly can be easily applied.

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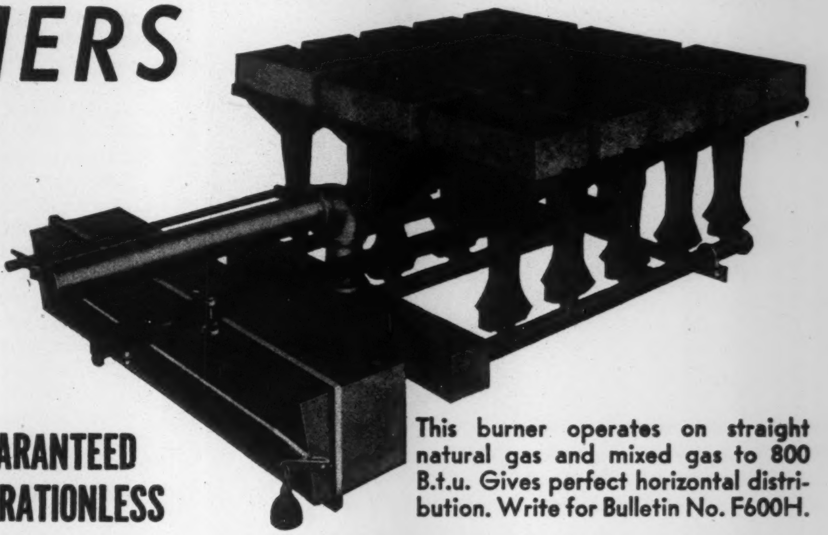


This burner operates on straight natural gas and mixed gas to 800 B.t.u. Gives perfect horizontal distribution. Write for Bulletin No. F600H.

THE WEBSTER ENGINEERING CO.

TULSA —DIVISION OF— **OKLAHOMA**

Surface Combustion . . . . Toledo, Ohio

ANY REFRIGERATION USER CAN

1. INCREASE REFRIGERATION CAPACITY
2. SAVE UP TO 35% OF POWER
3. SAVE CONDENSER WATER COST BY INSTALLING A

NIAGARA *Duo-Pass* AERO CONDENSER

Evaporative condensing with the NIAGARA Duo-Pass lowers condensing temperatures and reduces head pressures. Users have found that power savings as high as 35% have resulted at the same time that refrigeration capacity was increased. By reducing the condensing temperature, the NIAGARA Duo-Pass also prevents the deposit of scale on condenser tubes—holds the efficiency of the condenser constant and makes these savings permanent.

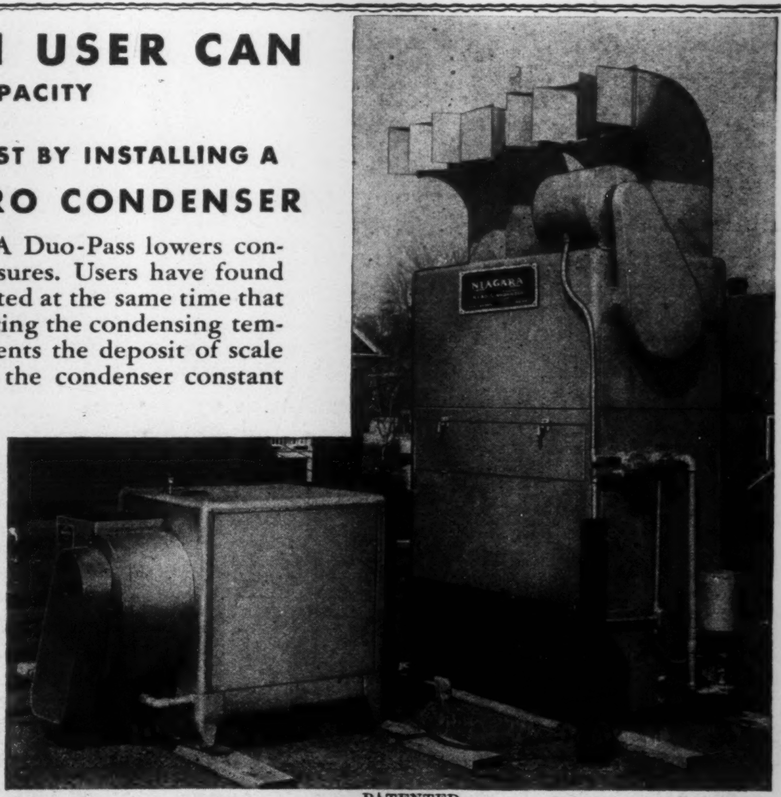
By the use of atmospheric air to take up the heat of condensation, 95% of condenser water is saved. As it replaces both cooling tower and shell-and-tube condenser, the NIAGARA AERO CONDENSER is inexpensive to install and offers refrigeration users the simplest and most practical way to increase capacity and cut costs.

Write for Bulletins 91 and 93

NIAGARA BLOWER COMPANY

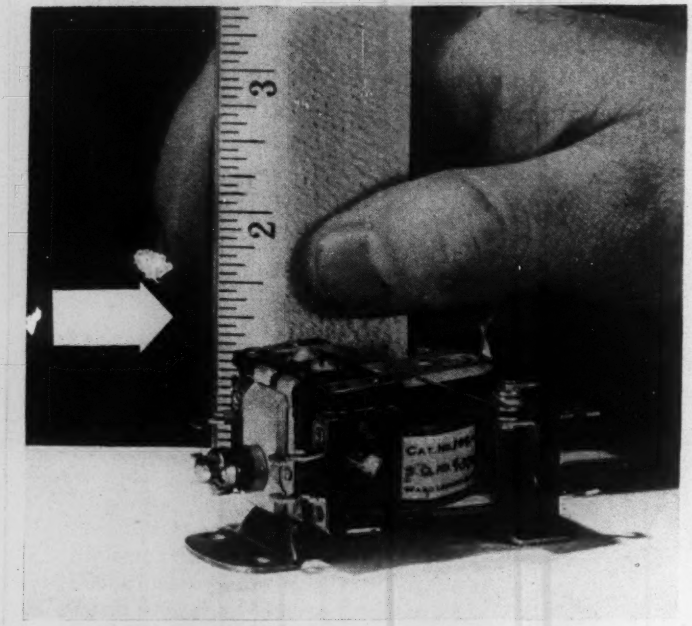
"25 Years of Service in Air Engineering"

NEW YORK ADDRESS: Dept. NP-34
6 E. 45th Street, New York 17, N. Y.
Field Engineering Offices in Principal Cities



PATENTED

NIAGARA *INDUSTRIAL* COOLING • HEATING • DRYING
HUMIDIFYING • AIR ENGINEERING *EQUIPMENT*



LESS HEADROOM REQUIRED for THIS RELAY . . .

The WARD LEONARD Midget Metal Base Relay measures only 1¼" in height. Its sturdy design permits continuous service on standard AC and DC voltages up to 110-115V. This double pole, double throw relay has the silver-to-silver contacts, characteristics common to all Ward Leonard Relays.

RELAY BULLETINS

Bulletins are available describing light, intermediate and heavy duty relays in various contact combinations, high voltage relays, metal and molded base midgets, aircraft power relays, transfer relays, sensitive relays, thermal and motor driven time delay relays, latch-in relays, and various types of radio relays. Send for data bulletins of interest to you.

ARMY E NAVY
ARMY E NAVY

WARD LEONARD

RELAYS • RESISTORS • RHEOSTATS

Electric control WL *devices since 1892.*

WARD LEONARD ELECTRIC COMPANY
31 SOUTH STREET, MOUNT VERNON, N. Y.

rately spotted. For night flying problems, these stars show as pin points of light. The navigational stars are placed so exactly that the navigator can take as accurate a reading with his sextant as if he were reading an actual star.

This "sky" is so sensitive that variations of more than 2 or 3 F in temperature will give the navigator a false reading, which, of course, would result in missing the exact area of the bombing mission. This is one of the prime reasons for the need for constant temperature, with 72 F inside temperature selected as the average condition to be maintained the year 'round.

Inside the bomber are all the actual controls, radio, navigational, and bombing equipment found on a real bomber. Here the air conditioning system protects these delicate instruments from dust and humidity, and insures their proper functioning.

Just beneath the plane an image of the ground is projected on a screen to simulate the terrain passed over. The "ground" moves at exactly the speed at which the plane is flying, while cloud formations are simulated by another projector. At the same time, every move of the crew is automatically recorded in the control room below. There an operator synchronizes the stars overhead, puts in the velocity and direction of the wind, and checks any mistakes made by the crew in carrying out their mission.

Engine Driven Arc Welder; New Electrode

No. 2571—A new "Shield-Arc" engine driven welder, rated at 200 amp, of light weight construction with an enclosed, rubber mounted engine of 29 hp, has been announced by the Lincoln Electric Co., 12818 Coit Rd., Cleveland 1, Ohio. This unit, supplied complete with base and canopy, has a current range of 40 to 250 amp. Dual control of welding current is accomplished by adjustment of series fields and generator speed.

For metallic arc welding, with bare or coated electrodes, it also supplies uniform welding current for carbon arc welding.

The generator control or "job selector" assures accuracy of open circuit voltage and permits precise control of engine speed of from 1500 to 1150 rpm for welding. In addition, this control may be used to reduce manually the engine speed to as low as 750 rpm whenever it is necessary to stop welding at intervals of a few minutes. This feature not only permits adjustment of engine speed to fit the individual job, but also affords improved welding and keeps down fuel consumption and engine wear, the maker states.

This company has also announced a new general purpose arc welding electrode for welding mild steel in all positions, with either alternating or direct current, named "Fleetweld 37."

A remarkable feature of it is that there is no slag interference when welding vertical down; this means excellent results are achieved in this position, the one in which greatest welding speeds on 8 to 16 ga steel are obtained, says the manufacturer.

New Basket for Strainers

No. 2572—Increased straining area and rugged construction are features of the new strainer baskets announced by Blackmer Pump Co., 1920A Century Ave., S. W., Grand Rapids 9, Mich. The baskets are constructed from heavy gage perforated sheet and are available with various size openings.

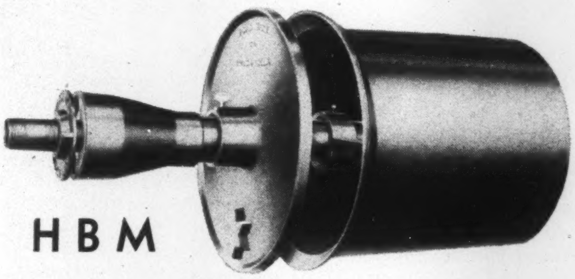
The use of the perforated sheet increases the net straining area up to 10 times the pipe area, which exceeds the recommendations of the Hydraulic Institute by a substantial margin, the maker says. Part of the gain in the straining area is achieved by the use of spot welding, made possible by the perforated sheet. The welding is not affected by high temperatures, and reduces friction loss. Another gain is realized through the use of the heavy material, as use of the perforated sheet eliminates the need for a solid frame.

These baskets will be used with all strainers in the "Ezy-Kleen" line.

You Name the HEAT PATTERN

we'll Produce it - - - -

We feel sure that this John Zink Short Flame Burner will fire a furnace to a higher rating than any other type of burner made, and still maintain even heat distribution.



HBM

Also that the HBM Burner is by far the most flexible burner ever made, as just about any type of heat pattern can be produced — Heat in front of the furnace — Heat in back of the furnace — Heat in center of the furnace OR uniform heat can be produced throughout the furnace.

This burner will burn anything that can come through a gas line—not damaged by slugs of water, gasoline or oil sometimes present in the fuel line.

Write for Details Now!

John Zink Co.
TULSA, OKLAHOMA

New York • Los Angeles • Detroit • San Francisco

AEROFUSE OUTLET

PROVIDES

1. Maximum Air Mixture
2. Rapid Temperature Equalization
3. Perfect Air Distribution
4. Total Elimination of Drafts

Attractive in appearance . . . Efficient in performance . . . Rigid one-piece construction . . . Easily and quickly installed . . . Large range of types and sizes to meet every Heating, Ventilating and Air Conditioning problem.

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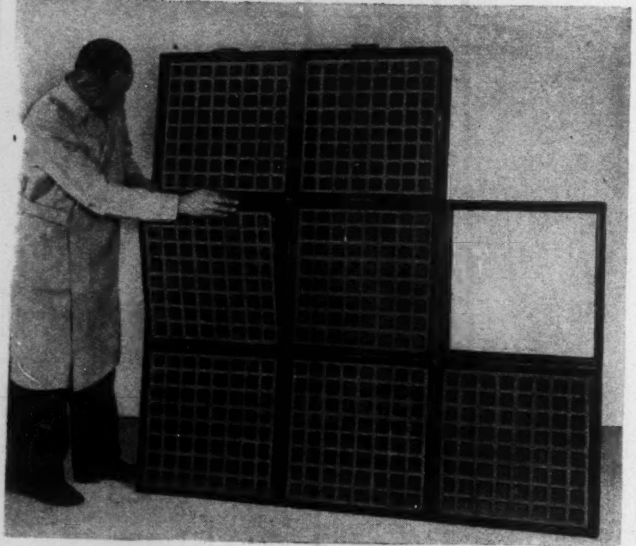
Send for the newest Aerofuse Outlet Engineering Guide and Catalog.

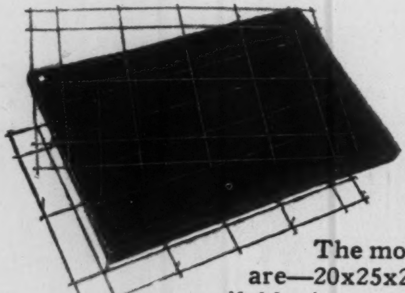
RESEARCH AIR FILTERS



for FILTER BANKS and INDUSTRIAL DUST COLLECTION

Research Air Filters are now used in leading office buildings, theatres, banks, department stores, clothing stores, restaurants, factories, and homes. They filter the air for crack streamline trains. Research Air Filters have proven their efficiency in industrial dust removal, central air conditioning, ventilating systems, railroads, forced warm air furnaces, unit air conditioners, paint spray booths, and air intakes on diesels and air compressors.

No. "200" Series Filter

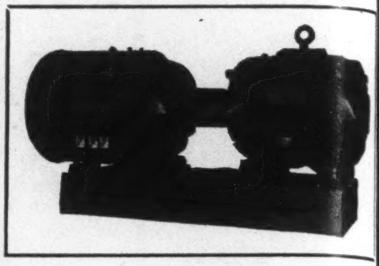


Research Air Filters are available for all standard sized filter banks. The most popular sizes are—20x25x2; 20x20x2. Also available in one inch thickness.

RESEARCH PRODUCTS CORP.

1015 E. Washington Ave. Madison 3, Wis.

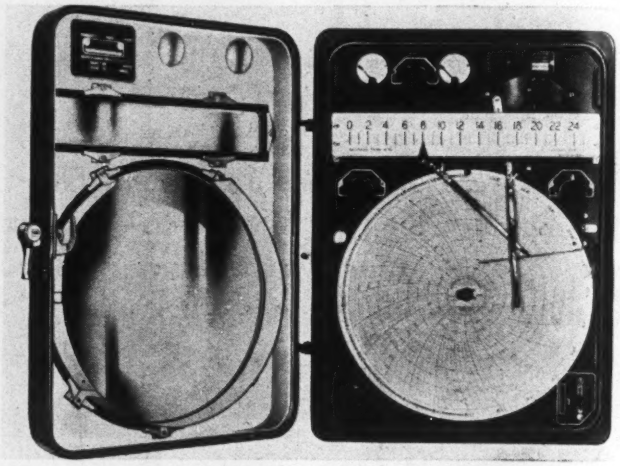
Motor Generator Set for Welding



No. 2573—The a-c to d-c motor generator set illustrated will supply welding power for from 15 to 30 men welding at the same time, says the manufacturer, Century Electric Co., 1806 Pine St., St. Louis, Mo. The motor is a 160 hp, 440 volt, 60 cycle, 3 phase, 1160 rpm, squirrel cage induction motor with drip proof construction. It drives a 70 volt, 1500 amp, flat compounded, direct current generator.

Redesigned Self-Balancing Potentiometer

No. 2574—The Bristol Co., P. O. Box 1790, Waterbury 91, Conn., has announced that the "Pyromaster" self-balancing potentiometer has been redesigned. The new model instrument has a universal wall or flush mounting case that is considerably deeper than the previous model, and has an internal hinged panel on which are mounted pen and indicator drive mechanism, and, in the case of electric controllers, the control contacts or proportioning slide wire, or in the case of air control, the complete new convertible type air operated control mechanism.



This new deep case and inner panel make it possible to service or replace any part or portion of the instrument without disturbing any other part. It also makes it possible, in the case of electric type controllers, to include the control relays in the instrument thus eliminating considerable external wiring, says the manufacturer.

Combustion Control Equipment

No. 2575—A new system of combustion control, said to make available to the smaller industrial and municipal power plant a regulation as effective and reliable as the "Metermax" system brings to the large central station, has recently been developed by Leeds & Northrup Co., 4970 Stenton Ave., Philadelphia 44, Pa.

Applicable to boilers fired with coal, oil, or gas, this system, known as "Type P," continuously proportions fuel and air to steam demand, and at the same time controls furnace pressure. To regulate fuel feed and draft (either forced or induced), the system provides a simple electrical balance (using the Wheatstone bridge principle) by which the settings of valves, dampers, or vanes are varied in pro-

SOMETIME (SOON?)

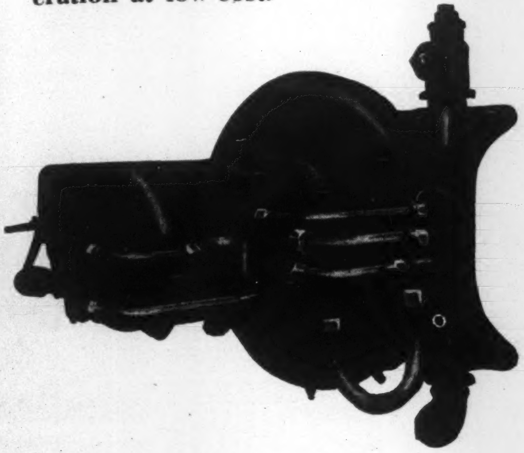
PETRO

REG. U. S. PAT. OFF

OIL BURNING SYSTEMS

will be available once more for normal business.

Their "Oil Miser" economy will contribute much to post-war efficient operation at low cost.



Automatic, semi-automatic or manual operation using No. 5 (or lighter) oil—or No. 6 (Bunker "C") oils, preheated. Capacities to 145 gallons per hour. 487 boiler H. P.—68,000 sq. ft. steam.

Even war-time research has not discovered any method of heavy oil combustion that equals or improves Petro's Thermal Viscosity principle of automatic firing at constant efficiency.

As a principle of design and operation, rather than a mechanical part, it can't wear out or break down. It cuts "service" as well as operating supervision.

Petro Engineers are working on post-war plans with a lot of Contractors. Can they help you?

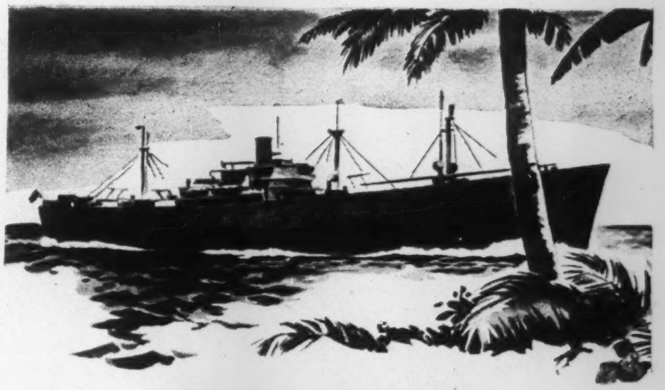
OIL IS AMMUNITION USE IT WISELY

Full data on Petro Industrial Burners are in our Catalog—see Sweet's or Domestic Engineering Catalog Files—or we will gladly send copies on request.

PETROLEUM HEAT AND POWER COMPANY

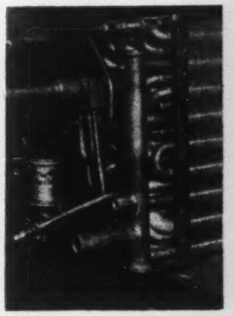
Makers of Good Oil Burning Equipment Since 1903

STAMFORD CONNECTICUT



HOW SIL-FOS HELPS FOOD FIGHT FOR FREEDOM

Above you see a Tee being brazed in prefabricating a section of ship's piping. No thread-cutting—no difficult assembly—just clean, flux and heat and you have a joint that equals the solid pipe in all essential properties. Below—a cooling unit fabricated completely with Sil-Fos joints.



The transportation of food to our fighting forces overseas is one of the vital jobs of the war. And a most important factor in this job is refrigeration. It is here that Sil-Fos makes a valuable contribution.

For this low temperature silver brazing alloy is now generally used in constructing the piping of refrigerating systems on ships. For example, there are approximately 300 Sil-Fos brazed joints in the refrigeration piping of many Liberty ships, as well as over 1,000 in the piping of most C-2 cargo ships.

In addition, Sil-Fos is used on an equally wide scale on other non-ferrous ship's piping, as well as on military, industrial, domestic and other commercial refrigerating equipment and installations.

This general use of Sil-Fos on non-ferrous piping, and also on a wide variety of other non-ferrous metal joining, is not just a war expedient. It was in well established use before the war and is founded on advantages that are vital to production at any time—exceptional speed, reliability and economy.

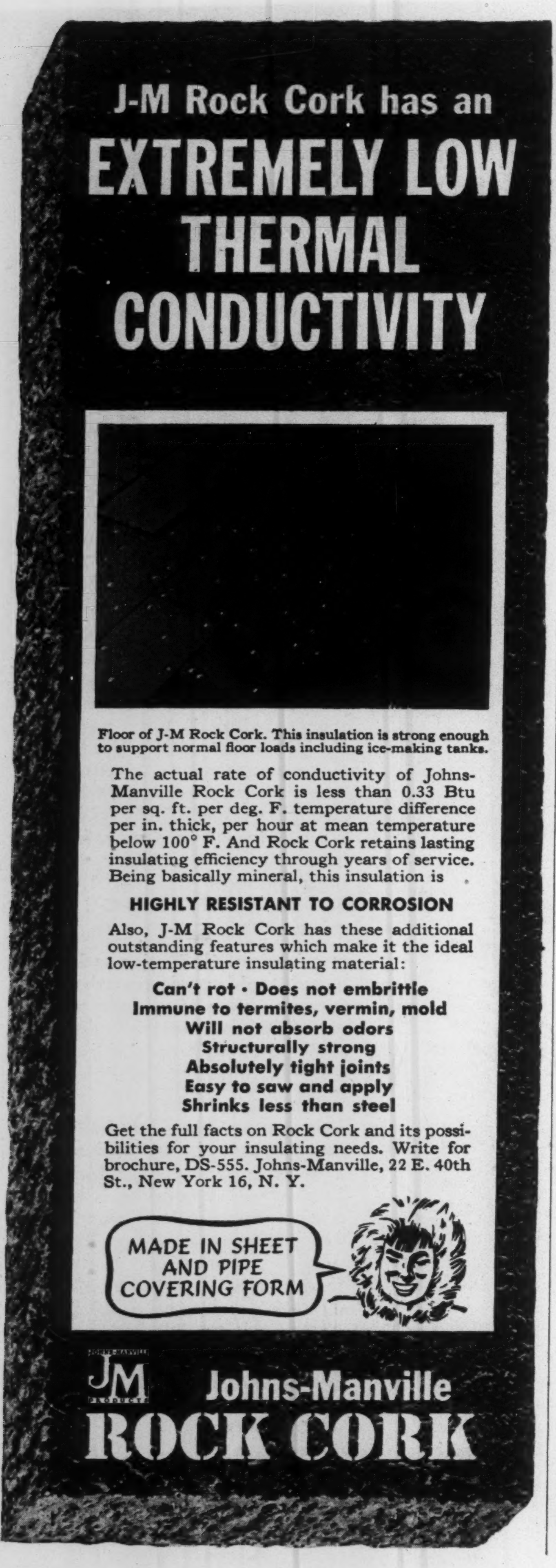
Bulletin 12-A gives the facts about Sil-Fos. Write for your copy today.

HANDY & HARMAN

82 FULTON ST., NEW YORK 7, N. Y.

Bridgeport, Conn. • Chicago, Ill. • Los Angeles, Cal. • Providence, R. I. • Toronto, Canada

Agents in Principal Cities


J-M Rock Cork has an

EXTREMELY LOW THERMAL CONDUCTIVITY

Floor of J-M Rock Cork. This insulation is strong enough to support normal floor loads including ice-making tanks.

The actual rate of conductivity of Johns-Manville Rock Cork is less than 0.33 Btu per sq. ft. per deg. F. temperature difference per in. thick, per hour at mean temperature below 100° F. And Rock Cork retains lasting insulating efficiency through years of service. Being basically mineral, this insulation is

HIGHLY RESISTANT TO CORROSION

Also, J-M Rock Cork has these additional outstanding features which make it the ideal low-temperature insulating material:

Can't rot · Does not embrittle
Immune to termites, vermin, mold
Will not absorb odors
Structurally strong
Absolutely tight joints
Easy to saw and apply
Shrinks less than steel

Get the full facts on Rock Cork and its possibilities for your insulating needs. Write for brochure, DS-555. Johns-Manville, 22 E. 40th St., New York 16, N. Y.

JM PRODUCT Johns-Manville
ROCK CORK

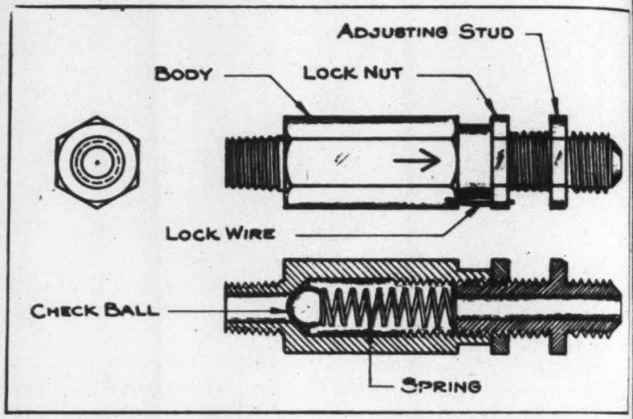
portion to steam demand as directed by a master controller. The remaining draft damper or other device is simultaneously regulated by the furnace pressure controller.

If for any reason the operator does not desire full automatic control, he can move any of the drive units from pushbutton stations. Without leaving the panel, he can switch from (1) full automatic control to (2) base load control, and regulate air supply from a single pushbutton with fuel supply automatically following in the proper relationship and with furnace pressure automatic. He can, as easily, (3) regulate both air and fuel from pushbuttons, with furnace pressure automatic. Or (4) he can switch to complete pushbutton control and regulate each drive unit separately from the panel.

This independent operation of drive units allows the controllers to be serviced without interrupting boiler operation.

New Relief Valve

No. 2576**—A new relief valve that permits a straight through flow has been developed for the handling of various liquids and gases. This relief valve features an external adjustment which permits pressure adjustment of the spring without removing the valve from the pipe line. It is particularly adaptable for use in a confined space where bends or turns are not readily made, says the manufacturer, Rogers Products Co., Inc., 3711 Hudson Blvd., Jersey City, N. J.

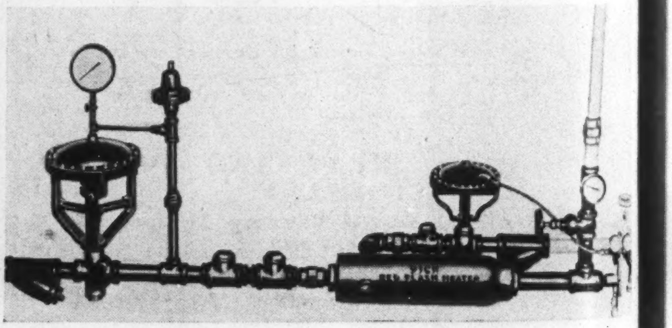


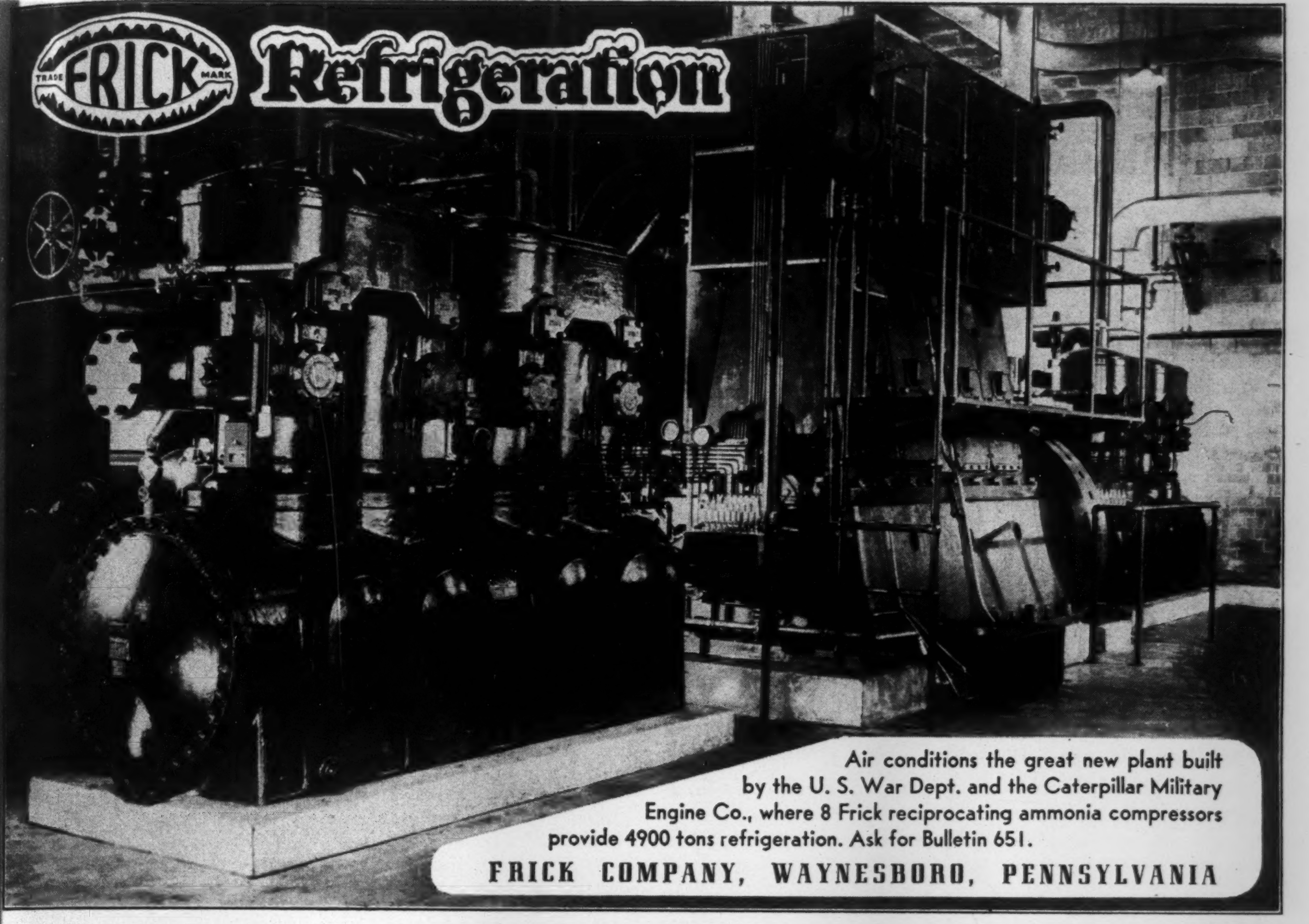
A lock nut is used to hold the adjusting stud after adjustment is made. The pressure of the lock nut also serves as a pressure-proof seal without the use of gaskets. These valves are available in all standard sizes up to 1 in. pipe size.

Instantaneous Hot Water Heaters

No. 2577—"Red Flash" instantaneous, tankless, hot water heaters for heating water with steam are now being manufactured for industrial and commercial needs by the Pick Mfg. Co., West Bend, Wis. Water is heated instantly in these heaters through blending with steam within a scientifically designed injection chamber, says the manufacturer.

Self-contained, and of compact design, they are made in three types—fully automatic, semi-automatic, and non-automatic—in sizes ranging from 10 to 200 gpm. No storage tank is necessary.





FRICK Refrigeration

Air conditions the great new plant built by the U. S. War Dept. and the Caterpillar Military Engine Co., where 8 Frick reciprocating ammonia compressors provide 4900 tons refrigeration. Ask for Bulletin 651.

FRICK COMPANY, WAYNESBORO, PENNSYLVANIA

Accurate Indication of Combustion Conditions

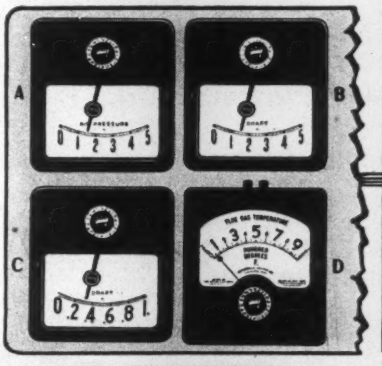
AT SURPRISINGLY LOW COST . . . BY HOTSTREAM

These gages tell you at all times exactly what you need to know about your furnace or boiler to insure efficient operation. Although highly accurate and dependable, they are inexpensive — and quickly pay for themselves in fuel savings.

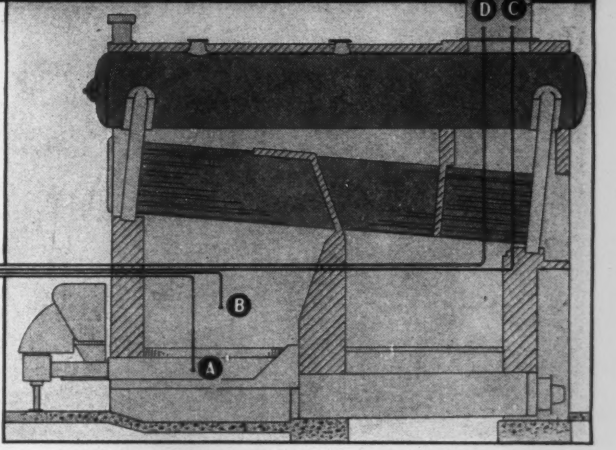
Ⓐ **HOTSTREAM PRESSURE GAGE**— indicates undergrate pressure, warns of impending blow-holes, clinker formations, and failing fuel bed. Makes possible accurate synchronizing of coal and air to insure ideal fuel bed.

Ⓑ **HOTSTREAM DRAFT GAGE**— indicates quantity of air furnished for efficient fuel burning. Makes possible accurate adjustment of "fuel-air ratio," and proper control of draft mechanism.

Ⓒ **HOTSTREAM DRAFT GAGE**— indicates stack draft available at all times. An ideal installation also uses DRAFT GAGES to indicate draft available after first, second and last pass — offering comparative readings to show efficiency of heat transfer and diminished draft caused by soot.



Ⓓ **HOTSTREAM THERMOGAGE** — electrically indicates temperatures of flue gases at boiler outlet, and offers a final check on degree to which boiler has absorbed useful heat.



Typical installation showing Hotstream gages indicating combustion conditions for efficient operation.

AGENTS: Several attractive territories are still open. Write for complete information.

Combustion Equipment Division

THE HOTSTREAM HEATER COMPANY

8007 Grand Avenue • Cleveland 4, Ohio

• NEW BOOKS & REPORTS •

Fuel Savings from Closing of Rooms and Use of Fireplaces

The engineering experiment station of the University of Illinois, Urbana, has just published bulletin No. 348 on Fuel Savings Resulting from Closing of Rooms and from Use of a Fireplace; the authors are Seichi Konzo, special research professor of mechanical engineering, and Warren S. Harris, special research associate in mechanical engineering. The bulletin is a report of an investigation conducted by the experiment station in cooperation with the National Warm Air Heating and Air Conditioning Association and the Institute of Boiler and Radiator Manufacturers.

Copies of this bulletin are available from the engineering experiment station for 40c; a limited number of copies are available for free distribution.

Studies were made of the fuel savings to be effected by closing of rooms in two insulated houses, in which the heating systems were automatically controlled. One house was heated by means of a gas fired, forced air system and the other by means of an oil fired, forced circulation, hot water system. In both houses the windows, including those in bedrooms, remained closed at all times.

When the heat input from the burner greatly exceeded the heat loss from the house and two of the unheated rooms were located directly above the room in which the thermostat was located, no actual saving in fuel consumption was accomplished, even though more than one-third of the living quarters were closed off. On the other hand, when the heat input from the burner corresponded to the heat loss from the house and the unheated rooms were not adjacent to the room in which the thermostat was located, a small saving in fuel consumption was effected by the closing of about one-fourth of the living quarters.

In any case, the actual reduction in fuel consumption was materially less than anticipated reductions based on floor area, room volume, and heat loss, since in computing the anticipated savings no account could be taken either of the orientation of the unheated rooms with respect to the heated portion of the house or of the adverse changes that might take place in the operation of the plant as a result of shutting off registers or radiators. Hence, any broad generalization that closing of rooms will result in material reductions in fuel consumption must be regarded with some caution.

Tests were conducted with and without the use of the fireplace in the living room. When the room thermostat was located in the dining room the temperatures in all of the rooms, except the living room, were maintained at about 72 F. Hence, the open fire in the living room served merely as an adjunct to the main heating plant. With this method of operation the gas consumption for the house was slightly greater than when the fireplace was not used.

When the room thermostat was located in the living room, the localized heating effect in the room by the open fire served to satisfy the demands of the room thermostat, with the result that the temperatures in the remainder of the house dropped several degrees below 72 F. Under these conditions, a substantial saving in gas consumption was effected by the fireplace fire. In order to obtain the maximum fuel conservation of the main heating plant with the least disturbance to comfort conditions in the house, the following method of operation is desirable:

1) Use the fireplace fire in the living room and reduce temperature, either manually or automatically, in all other rooms in the house.

2) Use the fireplace in mild weather in fall, early winter, and spring.

No matter how involved your plant layout may be, here is the most efficient solution of your heating problem:

DIRECTHERM

UNIT HEATERS STOKER-FIRED

HEAT MORE SPACE AT LESS COST

LOW INITIAL COST	— Saves money the first day
SIMPLE INSTALLATION	— No duct work, radiators or pipes needed
LITTLE MAINTENANCE	— Automatic controls do the work
WIDE HEAT SPREAD	— Heat "fans" out 200 feet
6 SIZES, ALSO FOR OIL AND GAS	— 300,000 — 1,700,000 BTU

May we send you our descriptive bulletin?

AIRTHERM MANUFACTURING CO.

711 SOUTH SPRING AVENUE, ST. LOUIS 10, MISSOURI

KRAMER

Products

Coils:

BARE TUBE, FINNED, PLATE.

Condensers:

AIR COOLED, EVAPORATIVE, WATER COOLED.

Unit Coolers:

COOLMASTER, FREEZING OVEN, (Electric Defrost)

FREEZING SHOWER, (Water Defrost)

FLOOR TYPE, RADIAL, PANEL.

●

AIR CONDITIONING UNITS
BLAST COOLING COILS
BLAST HEATING COILS
COMFORT COOLERS
UNIT HEATERS

●

Oil Coolers

●

Combustion Engine Radiators

●

Kramer System
(Balance Loader)

KRAMER TRENTON CO.

Trenton, N. J.

Make Good Piping Better

with **WELDOLETS • THREDOLETS**

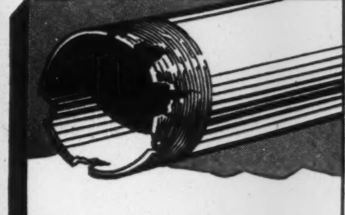
3 Types Meet Every Need

BONNEY WELDOLET
BONNEY THREDOLET
BONNEY WELDOLET

WeldOlets for butt welded branch connections.

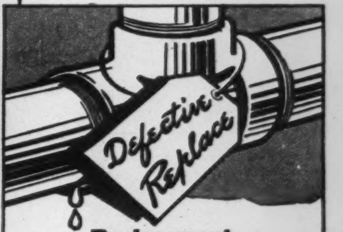
ThredOlets for screwed branch connections.

Socket-End WeldOlets for socket-type branch connections.



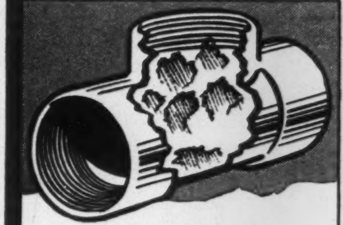
Threading

Threading weakens pipe walls as much as 40%—causes piping failures. WeldOlets, ThredOlets eliminate threading of main pipe—make junction of full pipe strength.



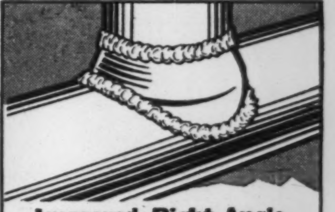
Replacement

WeldOlets, ThredOlets practically eliminate fitting replacement. Properly installed they provide trouble-free, leakproof junctions.



Corrosion

Because drop forging improve metal structure of WeldOlets, ThredOlets, they resist corrosion better than ordinary types of fittings.



Improved Right-Angle Outlet

WeldOlets, ThredOlets provide leakproof, right-angle branch pipe outlets of full pipe strength; improve flow conditions; eliminate worn threads; bolt tightening; reduce need for fitting replacements; corrosion.

WeldOlets, ThredOlets and Socket-End WeldOlets are suitable for all commonly used pressures and temperatures in every type of piping system. They are installed either before or after erection of the main line and always with ease and economy. They are equally well adapted to prefabricated or "on-the-job" assemblies. Their patented, funnel-shaped intake aperture improves flow conditions, reduces turbulence and friction.

Carried in stock for all standard pipe sizes up to 12" in size-to-size and reducing sizes—up to 24" on special order. Stock fittings are drop forged steel, but to meet unusual conditions can be supplied in Monel, Everdur, Toncan Iron, wrought iron, etc.

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▸ Ask your service man to place an A-P "TRAP-DRI" System Protector ahead of each expansion valve, regardless of make. This stops all dirt, acids, solder particles and moisture that may otherwise cause valve trouble and service expense.

▸ Then be sure he checks all expansion valves, replacing sluggish and inaccurate ones with A-P DEPENDABLE Thermostatic Expansion Valves. It's one way of preventing costly service shutdowns later, and assuring a smooth-operating system.

▸ This is *preventative service,* costing little now, that may save you money later, and provide greater efficiency from your display cases, storage units, and other refrigeration and air conditioning systems.

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Thermostatic Expansion — Solenoid — Constant Suction Pressure — Water Regulating Valves — "Trap-Dri" System Protectors — Water Solenoids — Cooling Thermostats . . *stocked and sold at refrigeration jobbers everywhere—recommended and used by leading refrigeration service engineers.*

A-P Model 205 Thermostatic Expansion Valve

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3) Use the fireplace only on relatively calm days.

4) Close the fireplace damper when the fireplace is not in use, or place a tightly-fitting cover over the front of the fireplace after the fire has died down.

Marine Pipefitting

The department of public instruction of the Commonwealth of Pennsylvania has just issued bulletin 345-O on Marine Pipefitting, a manual of instruction for beginning and advanced marine pipefitters. It was prepared in cooperation with the Sun Shipbuilding and Drydock Co., the school district of the city of Chester, Pa., and the U. S. Office of Education. Comprising 352 pp., 6 by 9 in., copies may be purchased from the printer, John Spencer, Inc., 8th and Sproul Sts., Chester, Pa., for $1.06. Payment must accompany the order.

The information given is presented in a very practical and understandable style, much of it being equally applicable to shore installations. There are sections on safe practices, pipefitters' tools, elementary pipefitting practice, machine operations, construction and use of templates, bending pipe without using templates, and lead working operations. There are appendices on shipbuilding terms, pipefitting terms, abbreviations, pipe test regulations, valve symbols, markings for piping, 45 deg and 60 deg offset charts, and applied arithmetic.

Plastics Handbook

If there could be any doubt that we are entering the "age of plastics," that doubt would soon be dispelled by examination of the exhaustive treatise, Handbook of Plastics, by Herbert R. Simonds and Carleton Ellis, assisted by M. H. Bigelow. To the average engineer whose interest in plastics has been the casual contact with an occasional plastic substitute for a product previously made of metal, or perhaps wood, it may come as a surprise that the plastic industry has progressed to the stage that a presentation of its technology requires a text of almost 1100 pp. The industry has expanded enormously during the past 15 years, however. The handbook is an effort, and apparently a successful one, to compile in a single volume a comprehensive reference work on the various branches of the plastics industry.

In brief, the book covers the nature, properties, production, fabrication, and utilization of plastics. In order to accomplish this the text is divided into nine sections, comprising 26 chapters in the first eight sections and a concluding section containing appendixes, glossaries, bibliography, and two excellent indexes, one of names and the other a general index of subjects.

Throughout, the book ties up theory and practice. While of necessity there is a lot of chemistry in the discussions, there is also great care taken to illustrate actual techniques and practices, and much information is given on commercial products and processes.

The term "plastic" covers a great variety of materials, and only the chemist or chemical engineer versed in this science can hope to grasp the technical significance of much of the chemistry and physics involved. Actually, all plastics might be reduced to four major classifications: natural plastics as shellac, rosin and bitumens; protein (nitrogenous) plastics as are derived from casein (a milk product) and soy beans; derivatives of cellulose (a carbohydrate composing the bulk of wood, cotton, etc.) such as cellulose nitrate and cellulose acetate; and finally the myriad array of synthetic resins derived from basic raw materials as petroleum, coal, water and air, examples of which would be phenol-formaldehyde in the condensation types and acrylic resins in the polymerization types. Physically, it is convenient to consider plastics as either thermoplastic (softening with heat) or thermosetting (hardening with heat).

This Handbook of Plastics has 1083 + xxviii pp., 6½ x 9¼ in., is published by D. Van Nostrand Co., Inc., 250 Fourth Ave., New York, N. Y., and sells for $10.—*K. S.*

Burnham— in the PACIFIC

This is part of a letter from one of many of our Boys somewhere in the Pacific which tells its own story.

[redacted]

Happened to be in the boiler room at our barracks and noticed the hot water boiler is an old Burnham 1804 round. Sure was a surprise to see them way out here. It works too — Burnham boilers like their employees do get around.

[redacted]

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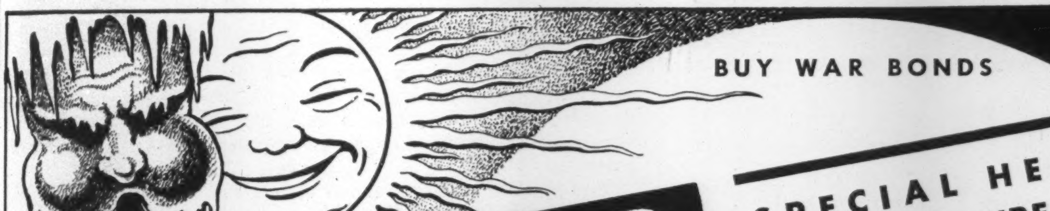
50 Church St., New York 7, N. Y.

Burnham Boiler



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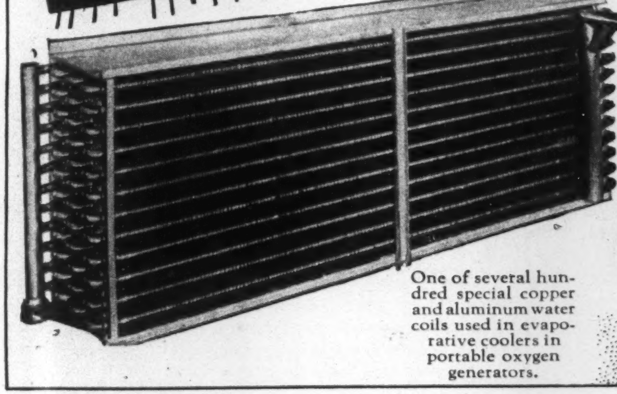

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builds **HEATERS** *that are*

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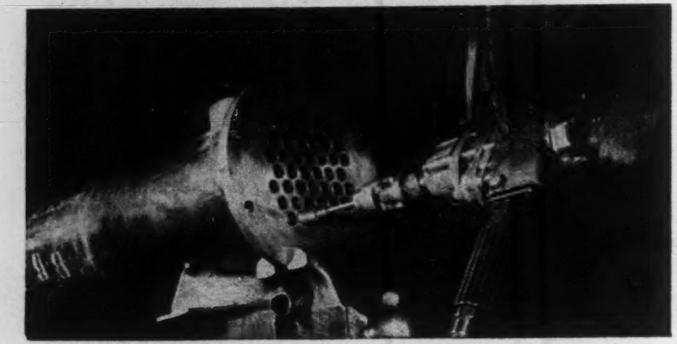

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STORAGE AND INSTANTANEOUS HEATERS
ECONOMIZERS • HEAT OR COOL WATER
OIL OR OTHER LIQUIDS

Conditions Required for Storing Works of Art

A wartime problem with peacetime aspects is discussed in detail in two papers published in the November-December 1943 issue of the Journal of the [British] Institution of Heating and Ventilating Engineers. One is entitled Some Physical Aspects of the Storage of Works of Art, by F. Ian G. Rawlins, scientific adviser to the trustees of the National Gallery, and the other covers the Engineering Aspect of the Wartime Storage of Art Treasures, by Paul Fletcher.

According to Mr. Rawlins, it has occasionally been maintained that *absolute* humidity is of consequence for the conservation of works of art, but there seems to be no evidence for this view, whereas much goes to show the importance of *relative* humidity. Temperature in general is only of significance for most objects insofar as it affects relative humidity. Certainly, says Mr. Rawlins, there are limits of appropriate temperature variation, but they are fairly wide, since the mechanical changes in dimensions brought about by them are less than those due to changes in relative humidity.

Putting aside the question of war gases for a moment (which, he says, seem to have little effect in the vapor form but are catastrophic in the liquid state), the action of sulphuric acids in the atmosphere may be serious enough to warrant special attention in certain circumstances.

One of the major storage hazards is mold growth, according to Mr. Rawlins, and at temperatures around 70 F, activity may be expected for a relative humidity of 68 per cent and higher. Excluding chemical methods of dealing with mildew, generous air movement and circulation seems to be the best way of combating this trouble. The chief aim, however, is to prevent the relative humidity from reaching 68 per cent. Available experience indicates that 55 per cent relative humidity at 60 F is most acceptable for objects of art, with a variation of perhaps plus or minus 3 per cent in relative humidity.

In the paper by Mr. Fletcher, he explains the policy adopted in England of concentrating the contents of national museums and art galleries in special storage spaces. In the two schemes he describes, safe storage below ground was provided, existing spaces with ample top cover being selected. The air conditioning problem presented by each required special features; although initial conditions in both were nearly identical, with saturated air at a temperature between 46 and 52 F.

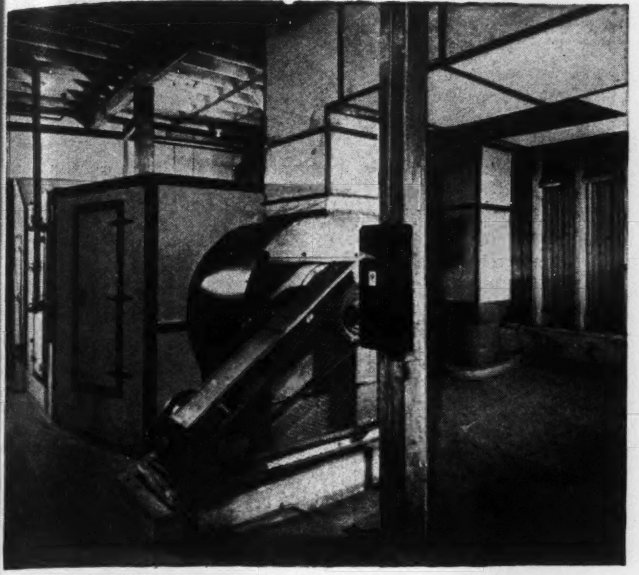
The method of air treatment in one case was determined by the unlimited supply of air which could be withdrawn from the space at a constant temperature and moisture content, and the conditions required could be obtained by heating and air circulation without the necessity for dehumidification.

The air conditioning unit used in the second scheme comprises a commercial type spray washer for humidification or dehumidification, with preheater and reheater. Refrigeration is furnished by three methyl chloride compressors rated at 12 hp each, using baudelot coolers to maintain the chilled water temperature at 34 to 38 F.

Cost of Refrigeration for Air Conditioning

In a paper on the Cost of Refrigeration Used for Air Conditioning, by Realto E. Cherne of Carrier Corp., published in the Journal of the American Society of Refrigerating Engineers for December 1943 and presented at the ASRE's 39th annual meeting in Philadelphia, the author describes a method of "reaching into the unknown and calculating a plausible answer"; some results calculated by the method were found to be within 5 per cent of actual costs later determined by metered readings.

It was reasoned that if power and water costs could be determined within reasonable accuracy for full load operating conditions, they could also be calculated for typical partial load conditions. Load sheets were prepared for about 15 sets of conditions representative of probable internal heat gains and summer weather variations. Weather



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Chrysler Corporation's Dodge Chicago Plant

In planning Chrysler Corporation's Dodge Chicago plant, top efficiency was the keynote throughout—in the building itself, its equipment, and construction materials used. For some of the air-conditioning system, CAREY FIREFOIL PANEL was selected for the same reasons it has been specified for other important installations—its inherent advantages, plus savings in war-vital metal.

CAREY FIREFOIL PANEL is a unique structural insulator. It is a hardened asbestos insulating board, consisting of corrugated asbestos felts firmly bonded and surfaced on each side with asbestos-cement sheathing. The result is a strong, rigid, fireproof, sound-deadening material. Eliminates vibration, is light in weight, and waterproof—will not rust and requires no painting.

CAREY FIREFOIL PANEL is designed especially for constructing plenum chambers, large ducts, and housings for air conditioning and other equipment. For information, write Dept. 100.

Illustration shows use of Firefoil Panel in air-conditioning unit installed by Narowetz Heating & Ventilating Co., Chicago, Ill. Plant designed by Albert Kahn, Associated Architects & Engineers, Inc., Detroit, Mich.

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WITHOUT BREAKING WATER CONNECTIONS

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records were then studied and tabulated to give groupings correlated to the partial load sheets.

It is pointed out in the summary of the paper that, although there have been considerable data published on operating costs, lack of consistency in presentation detracts from their usefulness. It is suggested that the ASRE could be of service in guiding the process of gathering and publishing operating cost information.

The paper has a bibliography of 28 references, of which 19 have appeared in Heating, Piping & Air Conditioning or in the ASHVE Journal Section, which is published in HPAC each month.

ABC's of Postwar Planning

The basic steps involved in the development of a practical postwar planning program are summarized in a 6 p. folder, Some ABC's of Postwar Planning, prepared by the policyholders service bureau of the Metropolitan Life Insurance Co. This study, intended as an outline of principles on which to base a postwar planning program, briefly discusses the following steps: (a) establish the objective, (b) assign the responsibility, (c) define the scope, (d) develop the facts, (e) set up a timetable, (f) prepare a formal plan, (g) implement the plan, and (h) get started.

A more comprehensive treatise on this subject is contained in the report, Planning for Postwar Operations, also issued by the Metropolitan. This survey is concerned with practical methods of organizing and conducting postwar activities.

The two fundamental objectives of the postwar plans of the companies included in the larger study were found to be: (a) to permit profitable operation of the business undertaking under postwar conditions and (b) to promote maximum employment.

According to the survey, when the general scope of the planning activities has been defined and the specific problems identified, consideration must be given to the organization aspects of postwar planning. Three general plans of organization, the committee plan, the individual assignment plan, and the decentralized plan were reported. Some of the advantages of each of these plans and a number of the factors to be considered in selecting a plan are reviewed.

Copies of either or both of these publications are available to executives who address the bureau on their business stationery. Address: Policyholders Service Bureau, Metropolitan Life Insurance Co., 1 Madison Ave., New York 10, N. Y.

Improving Design and Installation of Gas Air Conditioning Systems

A 4 p. pamphlet on Improving Installation Design and Reducing Investment Cost of Gas Air Conditioning Systems, by G. E. May, chairman of the technical advisory committee of the joint committee on gas summer air conditioning of the industrial and commercial and residential sections of the AGA, was recently published by the American Gas Association, 420 Lexington Ave., New York 17, N. Y.

It is pointed out that the ASHVE's Heating, Ventilating, Air Conditioning Guide contains all data necessary for calculating load requirements, but that the proper application of the data demands good judgment and can easily represent the difference between "an unnecessarily costly job lost to competition and a good job won by engineering skill."

Various items in the cooling and dehumidifying load analysis are then discussed step-by-step, including heat transmission through the building structure, sun effect, electric lights and appliances, persons, ventilation, and duct losses. The total of these factors represents a total of many reduced maximum simultaneous loads which may suggest a larger plant than may be necessary, depending upon the load factors which may be applied. (Load factor is defined to be the ratio of the actual required load to the estimated load.)

Load factor is then discussed briefly, and it is pointed out that it varies with the type of construction, nature of use, and nature of load.

RECENT TRADE LITERATURE

For your convenience in obtaining copies of these bulletins, see coupon on page 155. If you write direct to the manufacturer, describe carefully what literature you want, as the number given first in each item is for use only when sending in your request to Heating, Piping & Air Conditioning.

Air Conditioning, Refrigeration, and Space Heating

No. 4644—12 p. condensed catalog (AC-161) on air conditioning, refrigeration, and space heating, giving information in concise style for quick reference in selecting apparatus and related equipment. Sixteen general sizes and types of building space, with a typical installation to solve each problem, are illustrated and described. There is also a bibliography of special publications and magazine articles which analyze in detail the factors influencing equipment choice. Also, a 32 p. annual report for 1943, including a list of more than 70 war and essential industrial applications of the manufacturer's equipment, which throw light on the many ways in which air conditioning and refrigeration will be of service after the war.—Carrier Corp., 302 S. Geddes St., Syracuse, N. Y.

Blower Wheels

No. 4645—8 p. bulletin (75) giving dimensions and descriptive data on single inlet blower wheels and housings, with numerous curves of wheel performance and a wheel length proportion curve.—Lau Blower Co., 2001 Home Ave., Dayton 7, Ohio.

Chain Drives

No. 4646—20 p. booklet (1991) presenting a quick way to calculate chain drives, center distances, and chain lengths. The body of each table in the series presented gives exact center distances for a chain of 1 in. pitch and of the length listed in pitches in the first column of each table. Center distance for any other pitch of chain may be obtained by multiplying the tabulated values by the pitch.—Link-Belt Co., 307 N. Michigan Ave., Chicago 1, Ill.

Convectors for Postwar Buildings

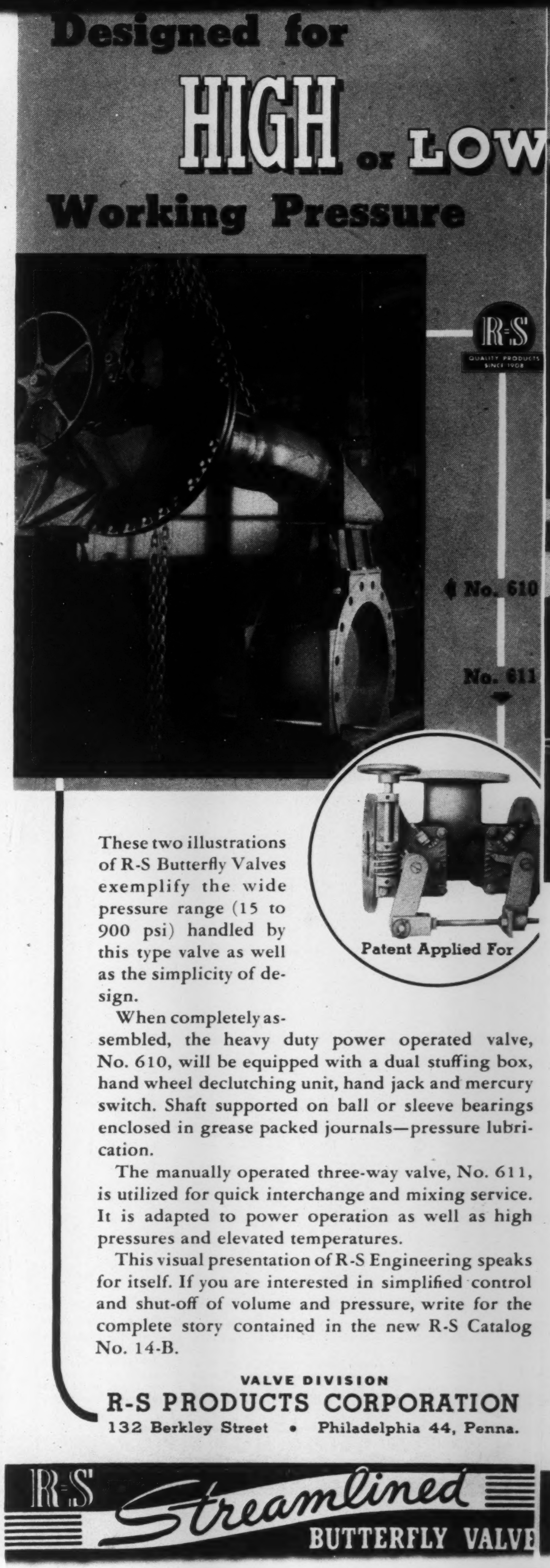
No. 4647—16 p. bulletin (SA-44) on convectors for postwar buildings, and on unit heaters and coils. Advantages of these convectors and design features are presented. There are numerous cutaway drawings and diagrams, tables of dimensions, information on installation, capacity tables, and other data.—Modine Mfg. Co., 1772 Racine St., Racine, Wis.

Copper and Copper Alloys

No. 4648—54 p. book of technical information for product designers on copper and copper alloys, including detail descriptions of 45 of the manufacturer's principal alloys, with graphic charts showing the physical properties, data on general and working properties, ASTM specifications which the alloys meet, and information on typical uses and applications.—Revere Copper and Brass, Incorporated, 230 Park Ave., New York 17, N. Y.

Feedwater Regulation

No. 4649—28 p. booklet on mechanical feedwater regulation for boilers, by Edward P. Culver, associate professor of mechanical engineering, Princeton University, the sixth edition of a text first published in 1938. It covers principles



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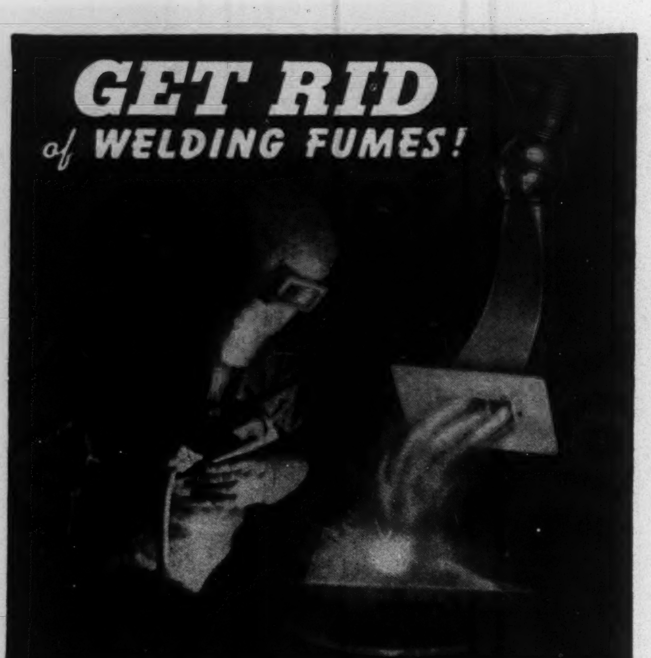

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of boiler feedwater control and describes mechanical equipment available to meet various operating conditions. Differential pressure control and feed pump control are also discussed.—Northern Equipment Co., 1945 Grove Drive, Erie, Pa.

Gages

No. 4650—12 p. bulletin on the "Duragauge," describing and illustrating various types and explaining design and construction features. Specifications, dimensions, and list prices are included.—Ashcroft Gauge Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn.

Insulating Varnishes

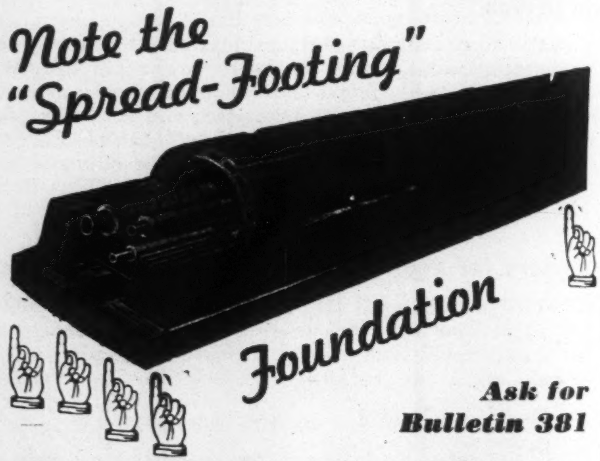
No. 4651—4 p. bulletin (243) announcing the "Speedairbonds," a group of air drying, insulating varnishes, designed for use in the manufacture and repair of electrical equipment.—Sterling Varnish Co., Haysville, Pa.

Maintenance of Air Conditioning Systems

No. 4652—Issue of "Oakite News Service" (Vol. 28, Nos. 1-2) featuring an article on air conditioning with interesting facts on the use of air conditioning in war production, food processing, textile and tobacco plants, hospitals, and for comfort applications, with particular emphasis on effective techniques for maintenance of such equipment. The article stresses the fact that regular care and attention must be given and presents data on how effective cleaning and related techniques help to solve the problems of scale, slime, odors, and corrosion. A number of case histories are included.—Oakite Products, Inc., 22 Thames St., New York 6, N. Y.

Metals and Alloys

No. 4653—24 p. booklet explaining the practical meanings of technical terms used in measuring the mechanical



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properties of metals and alloys, and describing the tests for measuring the properties of metals, as well as explaining how metals and alloys are judged by their properties. Published under the title The Technical Editor Speaks, the material comprises a series of 1 p. articles.—International Nickel Co., Inc., 67 Wall St., New York 5, N. Y.

Thermometers

No. 4654—20 p. catalog bulletin (20) on industrial thermometers of numerous types, illustrating and describing each, and giving dimensions, data on temperature ranges, and selection and other information.—Johnson Service Co., 507 E. Michigan St., Milwaukee, Wis.

Unit Heaters

No. 4655—Three new bulletins on unit heaters, the first being a 2 p. sheet (46S-6) which points out that these units save critical materials, and with information on construction, dimensions, ratings, etc. The second, on economical heating for industrial buildings, a 2 p. sheet (46E-22), contains similar information on another type of unit. The third, a 4 p. folder (46PQR-17), describes the advantages of four models of blower type heat diffusers, and includes rating tables and dimension drawings, and other engineering data.—Carrier Corp., 302 S. Geddes St., Syracuse, N. Y.

Valves

No. 4656—6 p. brochure describing a new line of air furnace malleable iron gate, globe, angle, and check valves recommended by the manufacturer for 150 psi steam pressure at 450 F where severe service conditions are encountered.—Jenkins Bros., 80 White St., New York 13, N. Y.

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No. 4657—24 p. catalog (406) on blast gate slide valves and butterfly valves for control of air, gas, and liquids.

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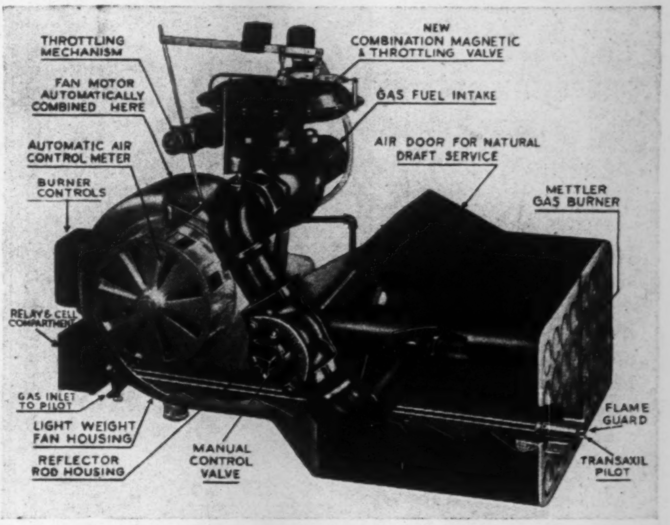
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ON COOLING TOWERS and CONDENSING UNITS with SOL-VET "08"

Find Out How This Water Treatment Formula Can Prevent Costly Scale and Slime in Your Equipment

If scale, slime, rust, algae are clogging up the lines of your cooling towers, condensers and other heat exchanger equipment look into the advantages of SOL-VET "08" service.

SOL-VET, highly recommended by leading engineers, offers you the facilities of one of the best equipped water laboratories in the United States. Thorough testing of your water can help determine the right SOL-VET "08" Cleaner that will prevent clogging—boost equipment capacity, save needless shutdowns for overhauling. Write today for complete data on SOL-VET "08" with free analysis and recommendations for your specific problems of removing scale and dirt.

Remember that if you find SOL-VET "08" is not exactly as represented —when used according to instructions, and full accurate report is given within 30 days from date of purchase—your money will be refunded in full.

MAIL THIS COUPON FOR FREE ANALYSIS

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☐ Please send complete data on SOL-VET "08."
☐ We are forwarding water sample and mechanical data—please send analysis and recommendations.

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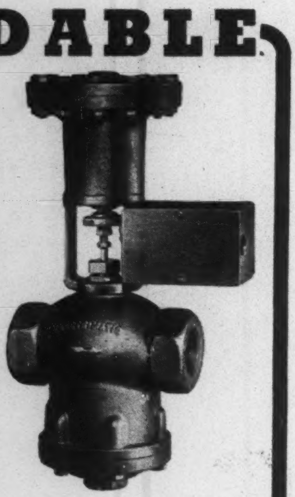

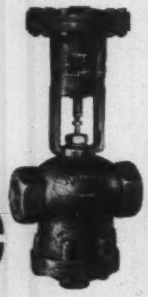

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TYPES WM AND WR PRESSURE ACTUATED CONDENSING WATER REGULATORS

Individually tested for efficient operation—these valves will give dependable, trouble-free performance. Diaphragm operated — For Ammonia, Methyl or Freon. Type WM incorporates a high pressure safety cut-out. Both types available in sizes ranging from 3/8" FPT to 2" FPT.

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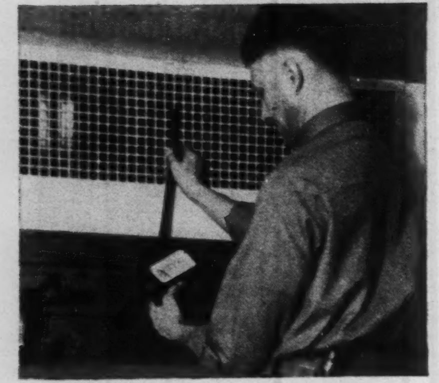


Alnor VELOMETER

★ all purpose air velocity meter

Instantaneous, direct readings of air speed measured in feet per minute with the *Alnor* Velometer give you the quick, accurate information on air movement needed to check operation of blowers, fans, air conditioning installations, and similar equipment. No calculations, no timing, no conversion tables; read velocities direct from the Velometer scale. Extension jets permit accurate readings in many locations that would be completely inaccessible with other means of measurement.

The Velometer is made in several standard ranges from 20 fpm to 6,000 fpm, and up to 3 inches static or total pressure. Special ranges available as low as 10 fpm and up to 25,000 fpm velocity and 20 inches pressure.

Write for Bulletin No. 2448-E.

Illinois Testing Laboratories, Inc.

419 NORTH LA SALLE STREET • CHICAGO 10, ILLINOIS

Numerous applications of these valves are listed, features are described and illustrated, and tables of dimensions are given. There is a full page air discharge chart.—W. S. Rockwell Co., 50 Church St., New York 7, N. Y.

Valve Selection

No. 4658—New valve selection chart, 11½ x 17 in. in size and printed on heavy cardboard for tacking up, which shows a simplified breakdown of conditions to consider when selecting a valve and an explanation of what these conditions determine in the operation of a valve. An example showing how the chart is used is given. This chart is intended for shop training and as a refresher on valves.—Reading-Pratt & Cady Div., American Chain & Cable Co., Inc., Reading, Pa.

V Belt Drives

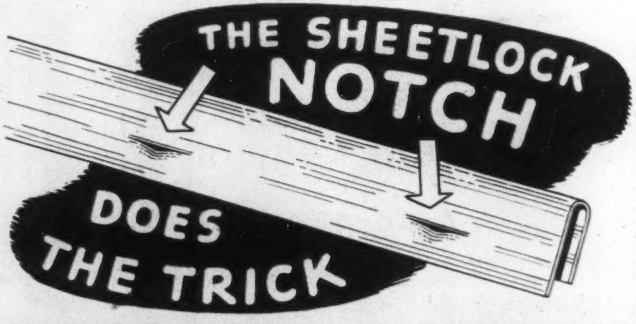
No. 4659—44 p. bulletin (B6249) describing the complete line of fractional horsepower "Texrope" v belts and sheaves, and offering simplified engineering data for fractional horsepower drives. Horsepower ratings are based on driven rpm and on belt velocity. Also included are working formulas from which correctly engineered fractional horsepower drives can be derived.—Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.

V Belts

No. 4660—4 p. folder on the manufacturer's line of v belts, featuring information about a recently announced wire grommet type.—B. F. Goodrich Co., 548 S. Main St., Akron, Ohio.

Water Softener

No. 4661—8 p. reprint on improvements in the hot process water softener, by C. E. Joos, giving a brief history of the



IN FABRICATING NON-METAL DUCTS

The notches run continuously along the length of Sheetlock Strip and grip and hold the sheet board firmly and securely. Simply push the board into the Sheetlock channel. The notch does the rest. No nails, bolts or screws required.

However, strapping should be used in fabricating ducts from heavy asbestos board. The Sheetlock notched strip holds the duct together while the strapping is being applied.

ANGLE SHEETLOCK
No. 10 for 1/8" Board
No. 11 for 3/16" Board
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Cement or caulking compound is unnecessary because the lip of the strip is held tight against the sheetboard thru spring action.

Sheetlock is also used in manufacturing cabinets, shower stalls, lockers, etc. Solve your fabricating problems by using Sheetlock on all non-metal sheets.

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development of this method of feedwater conditioning and discussing the chemical reagents, and both mechanical and chemical improvements.—Cochrane Corp., 3131 N. 17th St., Philadelphia 32, Pa.

Welding

No. 4662—40 p. booklet on low temperature welding for use with oxyacetylene, gas torches, metallic arc, carbon arc, atomic hydrogen, induction, resistance, and furnace welding. There are many facts on low temperature welding for fabrication, salvaging, and general maintenance, and numerous hints on how to increase welding efficiency with this method. There is a special chart to simplify rod selection and use.—Eutectic Welding Alloys Co., 40 Worth St., New York 13, N. Y.

Welding

No. 4663—2 p. mimeographed bulletin on low temperature welding, giving information on substitutes for critical silver solders.—Eutectic Welding Alloys Co., 40 Worth St., New York 13, N. Y.

Welding

No. 4664—12 p. issue of Sparks (Vol. 3, No. 1) devoted to piping and pipe welding in the petroleum industry, illustrating the labyrinth of piping required in refineries and featuring use of welding fittings to satisfy the conditions of oil industry piping.—Tube Turns, 238 E. Broadway, Louisville, Ky.

Welding Positioners

No. 4665—Circular announcing that Ransome welding positioning equipment is now available through district offices of the Worthington Pump & Machinery Corp., of which the Ransome Machinery Co., Dunellen, N. J., is a subsidiary.

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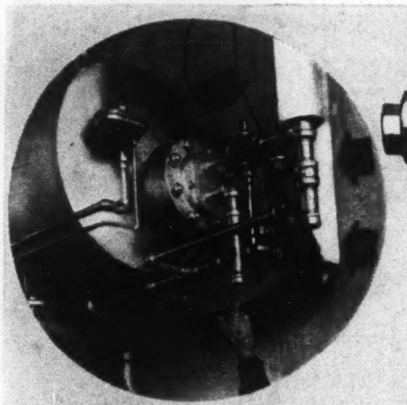

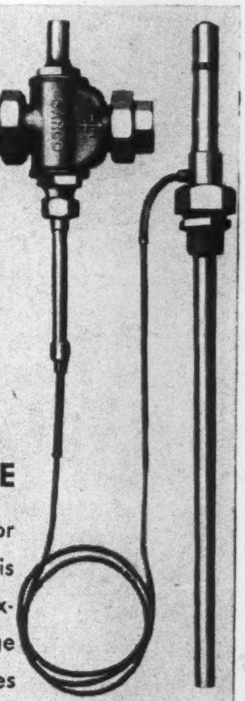

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Famous FIRE-GUARD *Automatic Coal Stokers* *have* EVERYTHING *you want*

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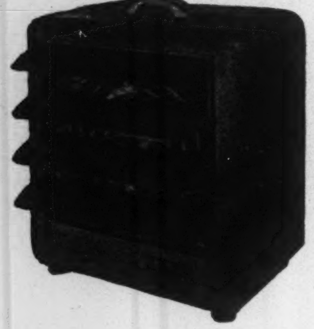
Permit early shutdown of boiler heating plants.



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AIR HEATERS

In Summer, maintain refreshing air circulation using blower only.

In Fall, put off the starting up of the boiler plant.

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In all heating seasons, give instant heat for overtime, Sundays, holidays.

Quick installation anywhere — a simple wiring job. Check now on the low operating cost. Ask your power company, or write us.

The Type HF heater, in four sizes – 1.5 to 4-kw. Other types up to 40-kw., for heating large areas. Chromalox heaters can be supplied with thermostatic control if desired. Available on proper priority.

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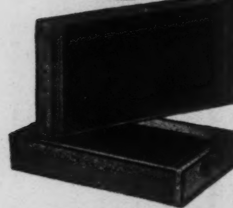

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WMC Releases Revised List of Essential Activities

A revised list of essential activities was released February 25 by the War Manpower Commission. All changes up to and including January 15, 1944, are included. Announcements of changes have been made from time to time but this is the first complete list published since December, 1942.

The list serves as a general guide upon which manpower programs for allocating labor to the different needs are based. It is primarily designed for the use of the United States Employment Service and the Selective Service System. The employment stabilization programs of WMC set forth the conditions under which workers may transfer from job to job, the conditions varying in accordance with whether or not the worker has been or is currently employed in an essential activity. The list is used by USES offices in determining the essentiality of the worker's employment. Selective Service Boards use the list in reviewing requests for occupational deferment.

The list consists of 35 broad categories. The specific references made to the products, services, and facilities are only generally descriptive of the types of activities regarded as essential. In the following paragraphs, the specific references have been omitted for some of the categories because of space limitations.

1) PRODUCTION OF AIRCRAFT AND PARTS.

2) PRODUCTION OF SHIPS, BOATS, AND PARTS.

3) PRODUCTION OF ORDNANCE AND ACCESSORIES.

4) PRODUCTION OF AMMUNITION.

5) AGRICULTURE AND COMMERCIAL FISHING.

6) PROCESSING OF FOOD.

7) FORESTRY, LOGGING, LUMBERING, AND FOREST INDUSTRIES.

8) CONSTRUCTION.—Highway and street construction; marine construction; construction of approved industrial plants, houses, hospitals, and military projects; repair

GET THAT AIR OUT OF THERE

With an
AUTO-VENT
AIR ELIMINATOR

Circulation Troubles?

Why continually fight air pockets or traps in hot or cold circulating lines? You can "get that air out of there" *and keep it out* simply by installing the No. 7 Maid-O'-Mist Automatic Air Vent. This reliable air vent has a self-closing float-controlled valve and is designed especially for circulating pipe lines, concealed radiators, unit heaters, cooling manifolds, tanks, diesel engines, or any other application where air pockets or traps retard the free circulation of liquids.

Now available in bright brass finish.

APPROVED FOR NAVY, MARITIME COMMISSION AND ARMY USE.

MAID-O'-MIST INC.
AUTOMATIC HUMIDIFIERS
211 NORTH ABERDEEN STREET
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of such facilities; and services necessary to complete such construction.

9) COAL MINING.—The mining of anthracite, bituminous, and semianthracite coal, lignite, and peat, and the operation of breakers or preparation plants. Includes also removing overburden and other such activities preparatory to coal mining operations.

10) METAL MINING.

11) NONMETALLIC MINING AND PROCESSING AND QUARRYING.

12) SMELTING, REFINING AND ROLLING OF METAL: SCRAP SALVAGE.

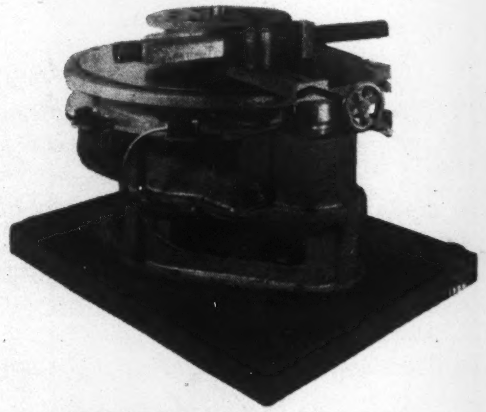
13) PRODUCTION OF METAL SHAPES AND FORGINGS.

14) FINISHING OF METAL PRODUCTS.

15) PRODUCTION OF INDUSTRIAL AND AGRICULTURAL EQUIPMENT.—Power boilers, wiring devices and supplies; agricultural implements; electric lamps; storage and primary batteries; pumps, compressors, and pumping equipment; recording, controlling, and measuring instruments and meters; conveyors, industrial cars and trucks; blowers, exhaust and ventilating fans; mechanical power transmission equipment such as clutches, drives, and shafts; mechanical stokers; tools, files, and saws; plumbers' supplies; professional and scientific instruments, photographic apparatus, and optical instruments; and all equipment necessary to operate plants producing essential commodities.

16) PRODUCTION OF MACHINERY.—Engines and turbines; metal working machinery and equipment; electrical generating, distribution, and industrial apparatus for electric public utility, manufacturing, mining, transportation, and construction use, for use in manufactured products or in service industries; construction, mining, agricultural, oil field, smelting, and refining machinery, as well as all machinery necessary to produce, equip, and maintain aircraft, ships, ordnance, and other military equipment.

PEDRICK BENDERS SAVE MONEY
Makes Serpentine, Box or Helical coils as well as simple bends.
Ask us how.



"C-2" Bender for 3" extra heavy pipe.
PEDRICK TOOL & MACHINE CO.
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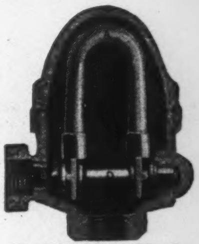
HAINES TRAPS



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F & T TRAP

Our operating member, the Bourdon Thermostatic Tube, is the strongest thermostat ever built into a Steam Trap. As the Bourdon Tube is used in gauges where accuracy is vital, it must improve the efficiency of a Trap.
There is no question whether a Haines Trap is functioning properly . . . it can be examined under pressure by simply removing the cover and all working parts are before you.
These Traps are designed to take care of any low pressure job up to 15 lbs. They will not become air bound as they employ the Bourdon Tube on the by-pass. Our underslung valve principle makes it safe at all times. No danger building up a pressure with this type of valve.
Furnished in sizes ¾", 1" and 1¼".
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Blower Wheel Housings
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Made in sizes to fit 4½, 5, 6, 7½ and 9 inch wheels and in widths to suit single or double inlet wheels . . . also individual parts for your own assembly.
De-Sta-Co housings are engineered for maximum efficiency and quietness in operation . . . neatly finished. Send for "De-Sta-Co Blower Housings" bulletin; gives complete information, including essential dimensions.
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Immediate Shipment. Order from your Supply House.

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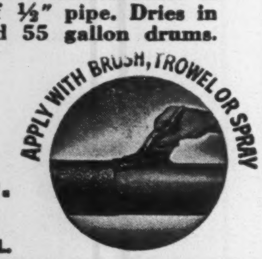
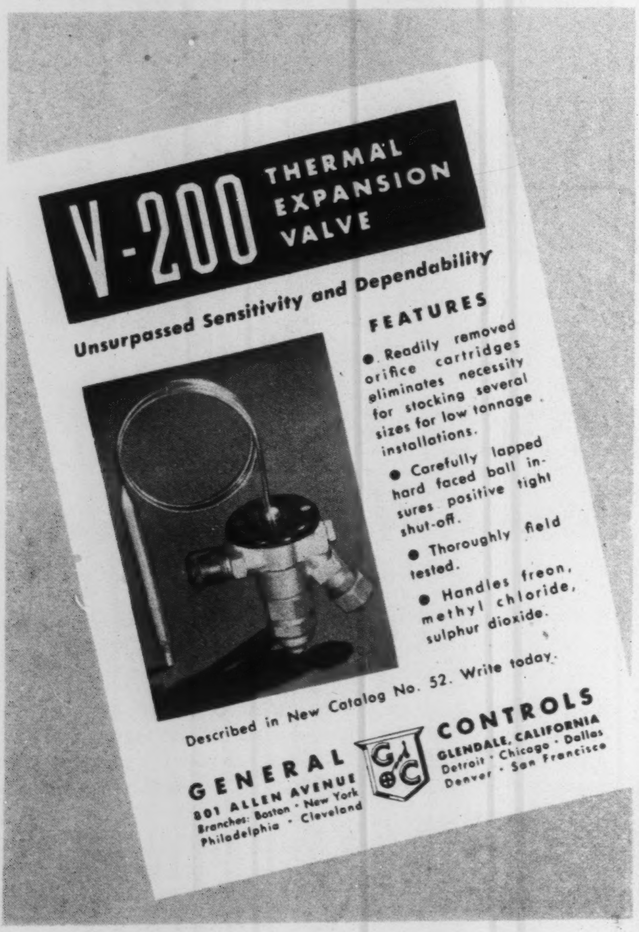

APPLY WITH BRUSH, TROWEL OR SPRAY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32) HEALTH AND WELFARE SERVICES.

33) EDUCATIONAL SERVICES.

34) GOVERNMENTAL SERVICES.

35) TECHNICAL, SCIENTIFIC, AND MANAGEMENT SERVICES.—The supplying of technical, scientific and management services to establishments engaged in war production; union-management negotiation services; publication of technical and scientific books and journals; and the services of Federal Reserve System district banks and branches (does not include services of member banks of the Federal Reserve System).

Marine Coppersmithing

Because—no doubt—of its general complexity and the lack of information about the trade, coppersmithing has been a neglected phase in the education of engineers and designers, says Frank J. Carr, of the Puget Sound Navy Yard, in the preface to his book on Marine Coppersmithing. It is the author's hope that his book will bring to their attention the many possibilities for efficient, streamlined design, light weight, and the saving of materials to be found in the use of copper for lines and fittings. In addition, this work has been written to help men of the craft to improve the quality of their work, and "to serve the craft itself by adding many skilled and competent coppersmiths to its number."

Examination of this book indicates that the author's objectives have been met very well. Many engineers and designers will, it is felt, be amazed at the things a coppersmith can do with his material. And certainly coppersmiths themselves will find a great many helpful and practical suggestions.

Among the subjects covered are tools and equipment, use of heat, annealing and melting temperatures, tinning and the use of solders, brazing, flanges, reducing a pipe and making a cup joint, branches, tube bending, templating, expansion joints, sheet brazing, sheet bends, and testing.

This book has 195 + ix pp., 5¾ by 8¾ in., and costs $2. It is published by the McGraw-Hill Book Co., 330 W. 42nd St., New York, N. Y.

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HIGH EFFICIENCY
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WATER FILTERS FOR ALL PURPOSES

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FOR HEATING AND COOLING IN A WIDE RANGE OF SIZES
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Detail of mechanical joint used in Universal Heat Transfer Coils.

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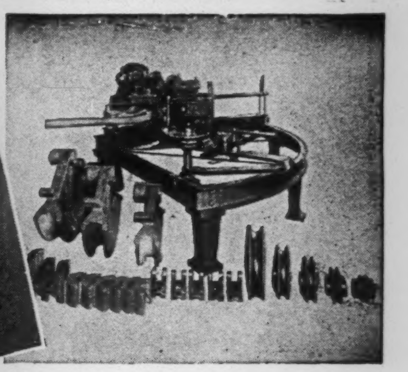

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Twelve types to select from. Hand operated capacities ¼ to 6" inclusive. Motor operated ¾ to 8" inclusive.

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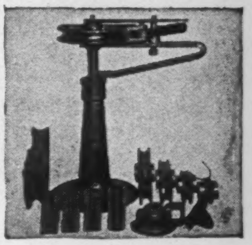

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Quick Deliveries
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Sales Executive Wanted

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The man to fill the position should

(1) Possess considerable native ability.
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(3) Be willing to work long and hard as the exigencies of the situation require.
(4) Should be able to analyze sales territories, markets, trends, etc.
(5) Have the ability to direct people and create esprit de corps within an organization.

He should possess those attributes necessary to profitably manage selling and merchandising activities involving a sales volume in excess of $10,000,000.

To such a man, substantial remuneration is available with profit participation depending upon the responsibilities he is able to discharge. *All information will be kept strictly confidential. Furnish complete details in writing direct to:*

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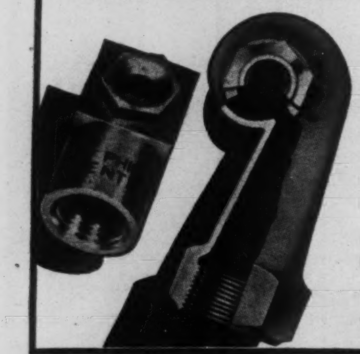

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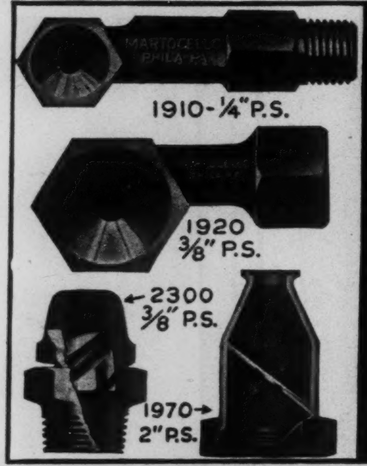
YARNALL-WARING CO.
107 MERMAID AVENUE, PHILA. 18, PA.



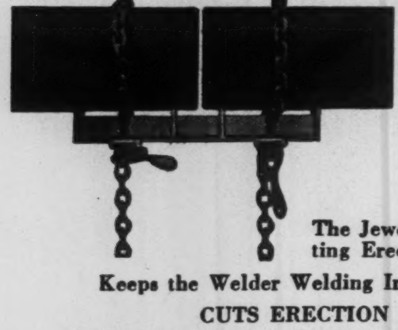
MARTOCELLO
SPRAY NOZZLES

Manufactured with precision and of a design which has been thoroughly tested for results and durability, they are guaranteed to give you satisfaction.

Successful efficient results depend largely upon selecting the proper number and type of Nozzle suitable for your installation. Consult with us.

Jos. A. Martocello & Co.
229-231 North 13th St., Phila., Pa.

PIPE WELDING TOOLS THAT MAKE WELDING PAY



Pipe Clamps
Flange Clamps
Elbow Clamps
Angle Clamps
Pipe Markers

TWO SIZES
½ to 8 in. 8 to 16 in.
Light—Adjustable—Fast

The Jewel System of Pipe and Fitting Erection Ready for the Weld

Keeps the Welder Welding Instead of Waiting

CUTS ERECTION COSTS

Modernize Your Own Methods and Tool Equipment

JEWEL MANUFACTURING COMPANY
1841 University Ave., St. Paul, Minn.

MEETINGS & CONVENTIONS

Fuels and Heating Course

Fuels and Heating Course, sponsored by the Illinois Fuel Merchants Association, Chicago, and the department of mining and metallurgical engineering of the University of Illinois, Urbana, to provide training for heating and ventilating engineers, coal merchants, and service men in combustion and utilization of coal. Some sessions are to be offered during March (the course started January 3). Sessions are held in Freeport, Waukegan, Downers Grove, Wheaton, Elgin, Quincy, Decatur, Ottawa, Joliet, and Aurora. Full information is available from H. C. Rountree, supervisor, engineering extension, University of Illinois, Urbana, Ill.

War Production Conference

War Production and Related Problems Conference, March 30, Hotel Stevens, Chicago, Ill. Panel No. 31, to be held from 10:00 to 11:50 a.m., is to be devoted to heating and air conditioning for war production, and is sponsored by the Illinois Chapter of the American Society of Heating and Ventilating Engineers. Samuel R. Lewis is chairman, and will speak on Advantages in Construction and Maintenance by Use of Liquid Heat Carriers. Irving E. Brooke will speak on Heating by Radiant Energy, and William S. Bodinus on High Pressure Air Distribution in Refrigerated Air Conditioning. Conference is sponsored by the Chicago Technical Societies Council, 205 W. Wacker Dr., Chicago 6, Ill.

Power Conference

Midwest Power Conference, seventh annual conference, April 13-14, Palmer House, Chicago, Ill. Theme of the meeting is to be "power brings victory," and it is sponsored by Illinois Institute of Technology, with other schools and various societies cooperating. Program includes papers on experimental stress analysis methods, by C. O. Dohrenwend, Armour Research Foundation; causes and prevention of boiler priming and solids carryover, by W. H. Rowand, Babcock and Wilcox Co.; corrosion problems, by L. G. Vande Bogart, Crane Co.; inhibitors in condenser tube alloys, by Austin R. Zender, Bridgeport Brass Co.; research in fuels as a postwar necessity, by A. R. Mumford, Combustion Engineering Co.; postwar outlook for oil fuels, by Arch L. Foster, Oil and Gas Journal; and statistical comparison of fuels, by C. C. DeWitt, Michigan State College. Conference director is Stanton E. Winston, Illinois Tech., 3300 Federal St., Chicago, Ill.

Foundrymen's Congress

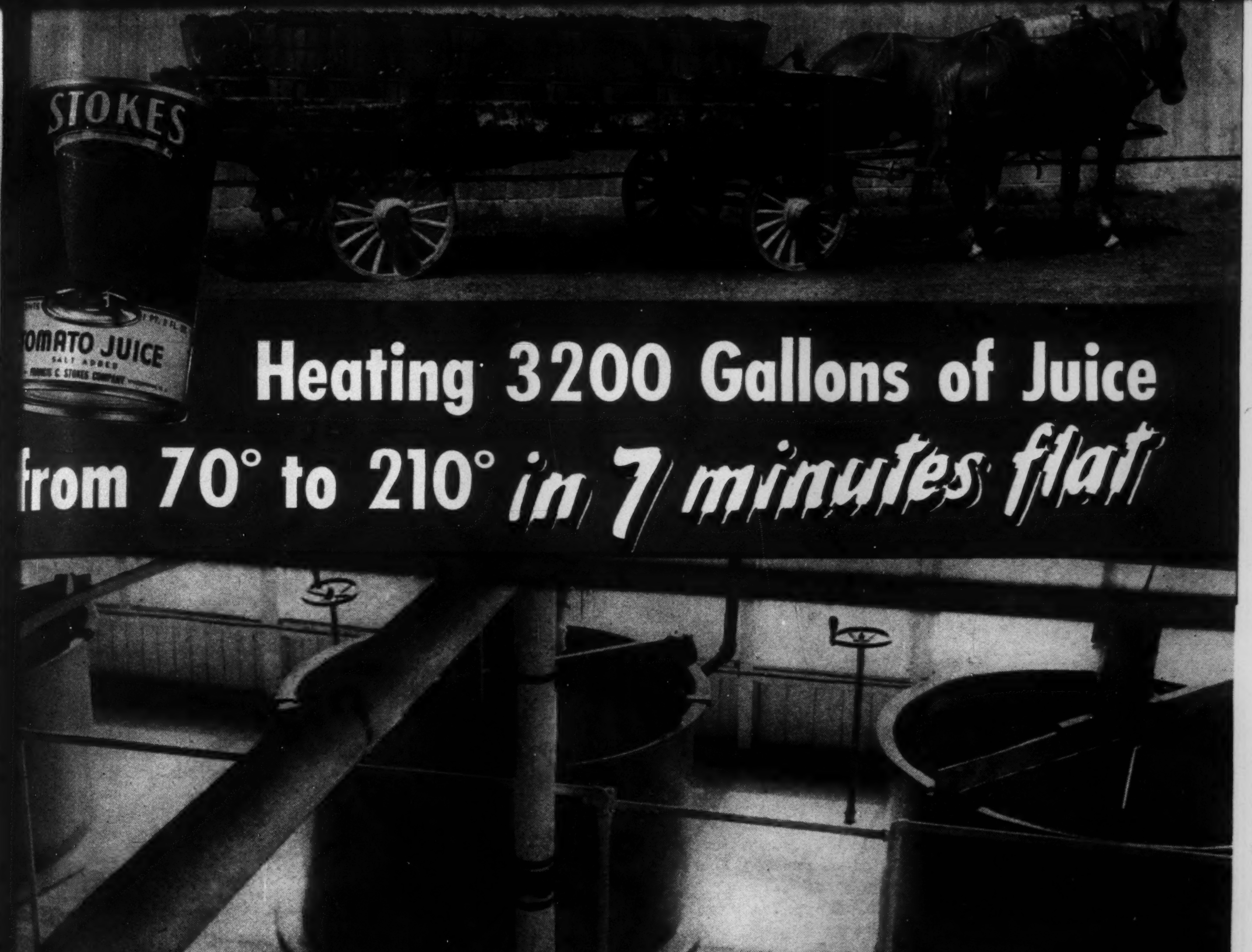
American Foundrymen's Association, third war production foundry congress, week of April 25, Memorial Auditorium, Buffalo, N. Y. There will be exhibit booths for conference and consultation, and displays of models, products, and equipment. Secretary of the AFA is R. E. Kennedy, 222 W. Adams St., Chicago, Ill.

Stoker Manufacturers

Stoker Manufacturers Association, annual meeting, June 1-2, French Lick Springs, Ind. Headquarters office of the SMA is at 307 N. Michigan Ave., Chicago 1, Ill.

District Heating Association

National District Heating Association, 35th annual meeting, June 20-21, Hotel William Penn, Pittsburgh, Pa. John F. Collins, Jr., 827 N. Euclid Ave., Pittsburgh, is secretary-treasurer of the NDHA.



Heating 3200 Gallons of Juice from 70° to 210° *in 7 minutes flat*

KEEPING up with the "tomato season" is a big job for men and equipment—for a ripe tomato can't wait.

Here at the Francis C. Stokes Co., cannery at Vincentown, N. J., four 1000 gal. cookers present a really difficult trapping problem.

However, a single little 2 inch Yarway Trap on the 2 inch double heating coils of each unit keeps lines free of condensate, and permits bringing the temperature of 800 gallons of juice from 70° to 210° *in seven minutes.* These traps have been in service 4 seasons, giving uninterrupted performance—having replaced other traps unsuitable for this continuous cooking work.

What are your trapping problems? Install a Yarway Impulse Trap or two and let them prove their merits. See how its *small size* saves space. How its *light weight and straight through piping* make installation *easy.* How its *only one moving part,* and its rugged *bar-stock construction,* cut maintenance costs. Then, too, there is *no need to change valve or seat for widely varying pressures.*

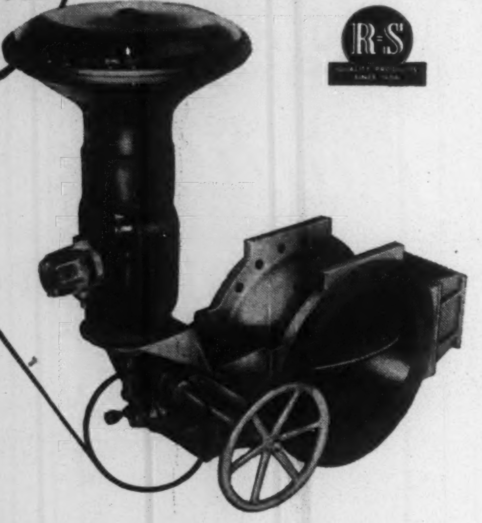
A nearby Mill Supply Dealer handles Yarway Traps and will be glad to serve you. Or write for Catalog T-1738.

YARNALL-WARING COMPANY, 107 Mermaid Ave., Phila. 18, Pa.

YARWAY IMPULSE STEAM TRAP

Forestall Valve Inaction

with
Declutching Unit
and Hand Wheel



No. 587

125-pound valve power operated by diaphragm motor. Declutching unit and hand wheel for use in emergencies.

While the majority of R-S Butterfly Valves are manually operated, they are also adapted to power operation. In such power installations, the inclusion of the R-S declutching unit (patent pending) and hand wheel has *four advantages*.

In the first place, if it is desirable to install a manually controlled valve and, at a later date, it becomes advisable to obtain some type of prime mover for automatic control, the prime mover can then be installed in the field.

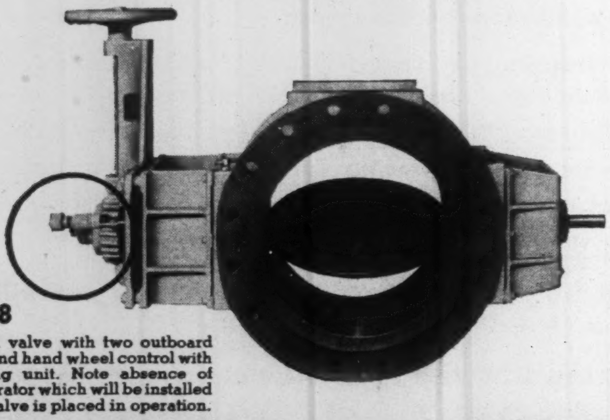
If the delivery date of the prime mover can not be made to coincide with the delivery of the valve, the valve can be installed and operated at once by hand.

A power failure will cause a power operated valve to be inoperative. Such is not the case, however, when a declutching unit and hand wheel are provided.

Likewise, the removal of the prime mover for maintenance, does not result in valve inaction since the valve can be operated manually at any time simply by removing the pull pin from the link which connects the diaphragm reach rod or piston to the link.

Investigate the many advantages of R-S Butterfly Valves **(15 to 900 psi)** and especially the merits of the R-S declutching unit and hand wheel.

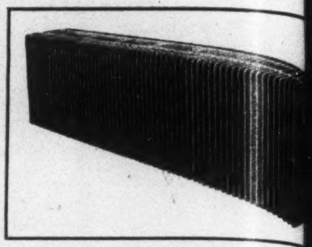
VALVE DIVISION
R-S PRODUCTS CORPORATION
132 Berkley Street • Philadelphia 44, Pa.



No. 588

125-pound valve with two outboard bearings and hand wheel control with declutching unit. Note absence of power operator which will be installed after the valve is placed in operation.

R-S *Streamlined* BUTTERFLY VALVES



ment, has been issued and assigned to D. J. Murray Mfg. Co., 1002-24 Third St., Wausau, Wis., according to a recent announcement.

This heating section is made in one piece of high test cast iron, so that there are no soldered, brazed, welded, or expanded connections in it, the manufacturer. The unit heaters and blast coils this section carry the trade name "Grid."

Illustrated is a condenser section as used in unit hea blast coils, and radiation. The sections can also be ada for use as radiators, both open and convector type.

Fibrous Glass Board For Ship Hull Insulation

No. 2584—Use by Owens-Corning Fiberglas C Nicholas Bldg., Toledo, Ohio, of an improved thermose plastic binder, employed to bond glass fibers, has ma possible to provide a rigid hull insulating board for and Maritime Commission vessels which, with a densi only 7¾ lb per cu ft, possesses all the thermal insula qualities of the 9 lb density board formerly supplie the manufacturer for this purpose.

The lighter board will effect a material weight sa in the vessels in which it is installed, and because it quires a lesser quantity of glass fibers, will aid the m facturer in supplying the greatly increased quantities o board called for by the shipbuilding program.

An accompanying increase in the manufacturer's o of fibrous glass textiles has made glass cloth availabl facing the hull insulating board, thus providing added resistance and consequent greater safety for all type ships. In addition, glass lagging tapes and cloths, use finish pipes and ducts aboard ship, are now available all types of Navy and Maritime Commission vessels. cause of the many urgent war demands, use of glass tex for these purposes formerly was restricted to certain t of combat ships.

Governor for Air Compressors

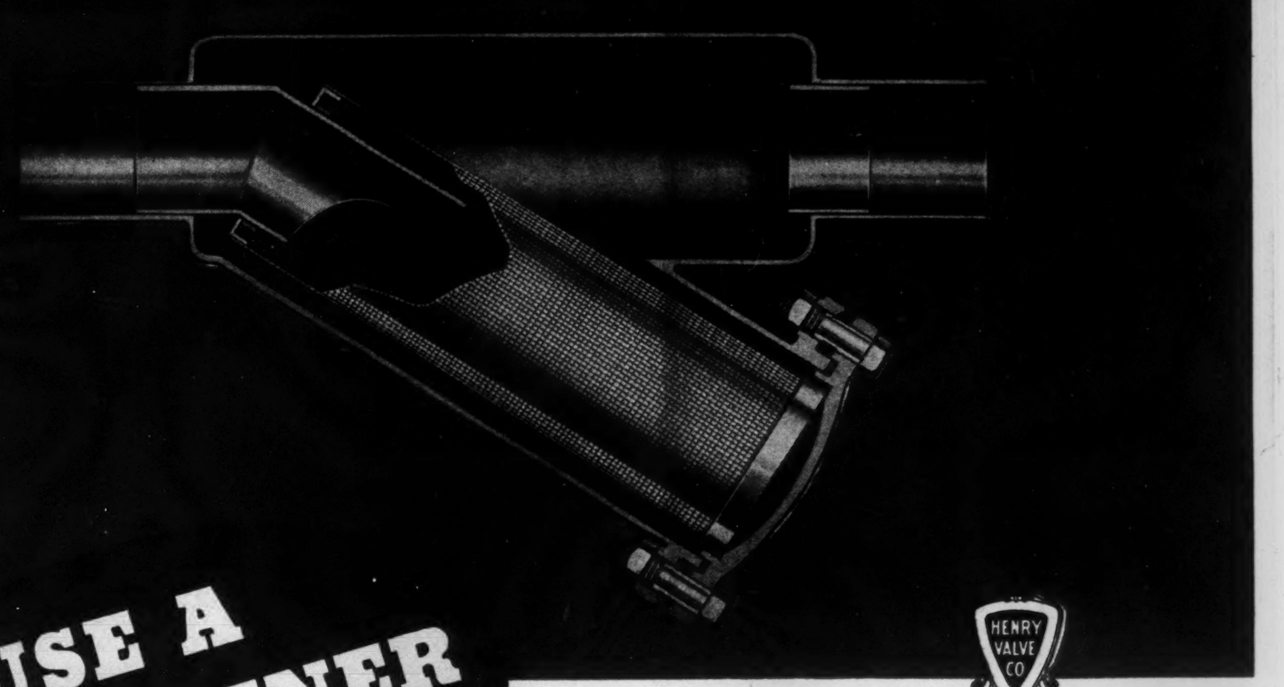
No. 2585—The Army ordnance department has secure inventor's patent for a young ordnance mechanic who, i spare time, developed a new way of conserving a piec automotive field equipment and saving critical gaso The Simpson control governor, named after Sergeant E Simpson of Gettysburg, Pa., now attached to the 874th nance company at Fort Dix, N. J., is a device that ca attached to the air compressor units now used in the U States and in all overseas theaters.

The principal function of the device is to reduce the s of the engine when the compressor is not under load. W attached to a small mobile air compressor, the idling s of the engine can be reduced 34 per cent, gasoline consu tion slashed 15 per cent, and exhaust temperatures creased 13 per cent, says the War Department. Used the large air compressor (16 cu ft), the idling speed of engine can be reduced 30 per cent, gasoline consump cut 11½ per cent, and exhaust temperatures decre 2 per cent.

It is expected that this control governor will greatly long the life of air compressors, reduce maintenance repairs, and save valuable cargo space that would other be used to transport gasoline.

Insulated Expansion Joints

No. 2586—The enormous plant building and expan program, undertaken to meet lend lease requirements to supply our own war machine, accelerated the dem for pipe line expansion joints. In addition, new ope ing requirements for high temperatures and pressures pled with the demand for giant sizes (approaching 10



USE A "Y" STRAINER for Large Capacity and Long Service

7 Reasons Why You'll Like It Best!

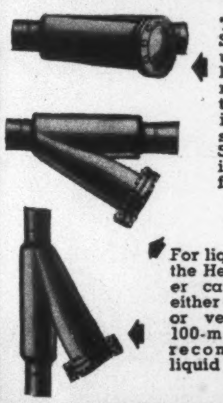
1. Light in weight – due to its tubular construction.
2. The strainer screen can be easily and quickly cleaned without removing the strainer from the line.
3. "Wave-Flow" design results in negligible pressure drop.
4. Cleaning seldom necessary because of large screen area.
5. Internal baffle prevents injury to the heavily reinforced monel screen. In this connection it is well to remember that suction velocities may exceed 5,000 feet per minute.
6. Patented forged steel clean-out flange is distortion-proof, making a tongue and groove anchored-gasket joint with strainer body.
7. Strainer is of welded steel construction. Rustproofed. Available with copper sockets for O.D. tubing and steel F.P.T. connections for iron pipe.

Available in ⅝" to 3⅝" O.D.S. sizes and in 1" to 3" F.P.T. sizes with screen area ranging from 23 to 175 square inches.

ue to its features of design the Henry "Y" Strainer not nly gives complete protection to condensing unit and con-rol equipment against scale and foreign matter that may e present in the system, but it also permits easy servic-ng with a minimum of interruption to plant operation.

The Henry "Y" Strainer, like other Henry products, has ecome the choice of the Army, Navy, Maritime Commis-ion and those who serve the refrigeration and air condi-ioning industry in time of peace as well as in time of war.

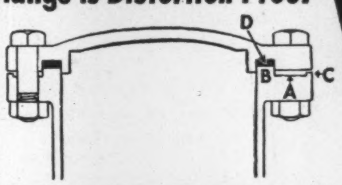
FOR SUCTION OR LIQUID LINES



The Henry "Y" Strainer when used in suction line service will not trap oil if the strainer is installed on its side as shown. 50-mesh screen is recommended for suction lines.

For liquid line service the Henry "Y" Strainer can be installed either in a horizontal or vertical position. 100-mesh screen is recommended for liquid lines.

Why the Patented Henry Flange Is *Distortion Proof*



Strains due to uneven or excessive tightening of bolts are absorbed in the recessed area (A) and cannot be transferred to the flange gasket face (B) made up of the inner flange rim and the strainer housing to which the flange is welded. Lip on outer flange rim (C) acts as a "stop" to prevent excessive drawing up of bolts. Gasket is located in recessed area (D). Flange makes tongue and groove anchored-gasket joint with strainer.

HENRY VALVE Company

●

3260 West Grand Ave.
Chicago 51, Illinois

SOLD BY LEADING JOBBERS EVERYWHERE

ID) taxed the resourcefulness of engineers and shops alike. Before the war the approximate temperature limit of successful operation was 800 F; today, in refinery use alone, joints are operating at from 1000 to 1200 F.

Because of the great size of new refining and chemical plants, in which equipment is located high above the ground to obtain suitable static heads, pipe line lengths are considerable. Consequently, if lines operate at elevated vapor temperatures the expansion movements to be absorbed, either by large loops or expansion joints, become of extensive magnitude, according to Foster Wheeler Corp., 165 Broadway, New York, N. Y., in a recent publication.

The expansion movements which must be provided for are a combination of axial or linear, and offset or lateral. "Universal" joints will absorb either, or both, of these movements.

The "Universal" joint is employed when the pipe line is anchored, thus compensating for thrust and weight. A special adaptation of the "Universal"—the "Tied" joint—is applied where long tie rods are used to compensate for thrust and weight, the joint maintaining a fixed face-to-face position and absorbing any directional or offset movement required. This type is usually installed where piping is left more or less unsupported.

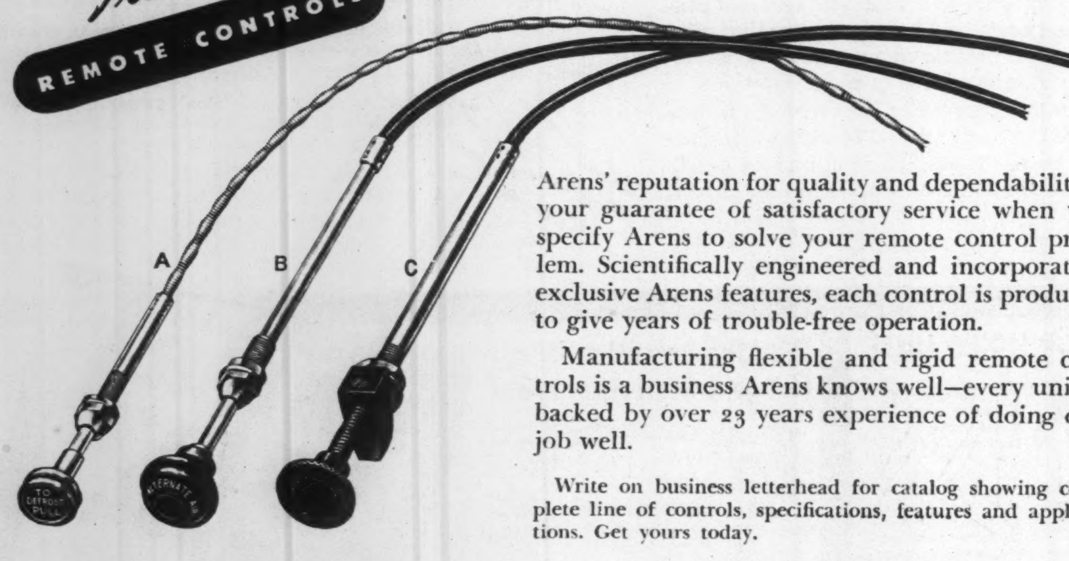
The "Hinged" joint is customarily employed on large vapor lines overhead, where it is impractical to use either guides or supports. Thrusts from internal pressure, weight, and other possible sources, including wind loading, temperature changes and earthquake, may be severe. Straight sections of the pipe are allowed to assume new positions through flexibility of linkage provided by the joint. In pipe lines of this sort one to three joints are generally used, depending upon whether any portion of the pipe can withstand bending forces. The hinges and pins of the joint are designed to absorb all of the above forces. If, for example, three hinged joints are used in an overhead line, the straight sections between the joints can actually take new positions as the joints themselves allow certain angularities.

There are two principal methods of designing such lines: First, to allow the pipe line, all parts and fittings, to operate at the full temperature. As the temperatures usually impose stresses beyond the range of allowable limits for carbon steel, alloys up to and approaching stainless steel of the 18-8 variety are required. Due to lengths involved, high temperatures, and higher coefficients of expansion of these stainless alloys, the expansion movements to be absorbed by expansion joints are considerable.

The second method is to insulate the entire piping internally. This reduces the operating wall temperatures, permits the use of ordinary steels, and decreases the pipe line growth. However, pipe diameters are increased to provide room for the insulation. In many plants recently erected the piping has been insulated with a combination of cast tile and asbestos, 7 in. thick, whereas the insulation of the joints themselves, in order to decrease diameters, has been approximately 2 in. These units can withstand higher operating temperatures and can more easily be replaced. From a cost standpoint the engineers must balance expensive alloy piping material and multitudinous special joints against the cost of insulation with larger pipe lines and larger joints, but joints of more moderate movements.

As regards the joint itself, the bellows elements are constructed of stainless steel and consequently are suitable for high temperatures. However, the cylinders and flanges must be specially designed for the actual operating temperatures which in most cases require alloys. Usually it is more practical to insulate the joint and resort to ordinary steels. Another point to consider is where a sour crude oil or other corrosive influence is involved and the corrosion problem becomes increasingly difficult. In these cases the insulated lines can be of alloy and, due to the lack of high stress, can be of relatively light wall. In comparison, in an uninsulated line the entire piping must be of alloy and of considerable thickness to provide allowance for corrosion as well as imposed stresses.

Flexible REMOTE CONTROLS TO MEET YOUR REQUIREMENTS



Arens' reputation for quality and dependability is your guarantee of satisfactory service when you specify Arens to solve your remote control problem. Scientifically engineered and incorporating exclusive Arens features, each control is produced to give years of trouble-free operation.

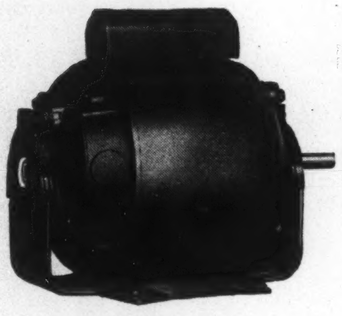
Manufacturing flexible and rigid remote controls is a business Arens knows well—every unit is backed by over 23 years experience of doing one job well.

Write on business letterhead for catalog showing complete line of controls, specifications, features and applications. Get yours today.

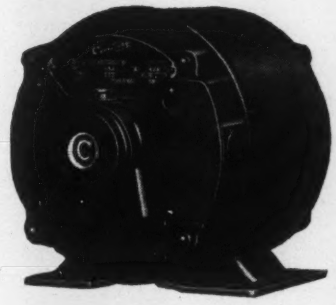
Control Heads (A) shows locking type head which permits rapid push-pull adjustment and permanent locking by spring actuating button control. (B) one of many styles of standard rapid push-pull control heads. (C) Vernier control head permits rapid push-pull adjustment or rotating micro-fine adjustment in the same control.

ARENS CONTROLS, INC.
2267 South Halsted Street, Chicago, Illinois

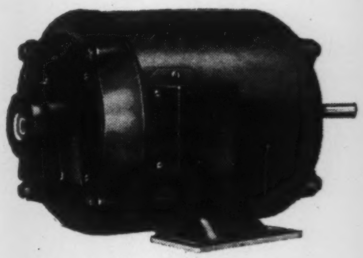
ITS UNDER PERFECT CONTROL IF ITS ARENS



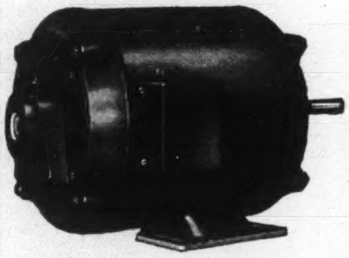
Capacitor Single Phase Induction Motor — Built in sizes 1/20 to 20 horsepower



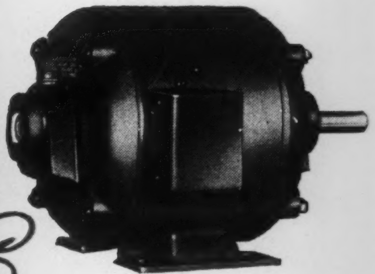
Split Phase Induction Motor—Built in sizes 1/20 to 1/3 horsepower



Single Phase Repulsion Start Induction Brush Lifting Motor—Built in sizes up to 20 horsepower



Direct Current Motor — Built in sizes 1/20 to 300 horsepower



Squirrel Cage Polyphase Induction Motor — Built in sizes 1/6 to 600 horsepower

The Quiet Performance of CENTURY MOTORS

Means More Comfortable Air Circulation and More Satisfaction for Your Customers

Quiet starting and quiet operating is built into every Century motor for fan, blower, unit heater, and other air circulating applications, because your customers demand it. Unusual freedom from vibration, rigid construction, precision bearings in perfect alignment, unique end bumpers, and many other construction features contribute to the unusually quiet operation of Century motors.

There's a wide range of sizes and types, from 1/20 to 600 horsepower. Many can be furnished in both rigid and cushion base rubber mounted frames.

Whether you manufacture, sell, or install motor driven equipment, it will pay you to bring your electric motor drive problems to a Century engineer. His experience and advice can be valuable to you.

CENTURY ELECTRIC COMPANY
1806 Pine Street, St. Louis 3, Missouri
Offices and Stock Points in Principal Cities

Century
MOTORS

366

• NEW BOOKS & REPORTS •

Apprenticeship Textbooks in Steamfitting Published

The apprenticeship program in the trade of steamfitting has been carried another long step forward through the publication of the Instruction Manual for Steamfitting Apprentices in three volumes. Now the steamfitting trade has national standards for steamfitting apprenticeship, and suggested local standards for training steamfitting apprentices both prepared by joint committees representing employers and employees and both formally approved by the Heating, Piping and Air Conditioning Contractors National Association, the United Association of Journeymen Plumbers and Steam Fitters of the United States and Canada, and the Federal Committee on Apprenticeship. The next step is "What shall we teach?", and that is answered by the new book. The textbook is composed of material selected by the Washburne trade school in Chicago. This course is based on more than 20 years actual experience in teaching steamfitter apprentices. The publication of the book is the result of the active cooperation of employer and employee in Chicago's joint arbitration board of the steamfitting industry.

These volumes contain special information on heating and piping which the apprentice needs, and material on related subjects. Sufficient text material is included to cover the needs of the student in a five year course.

Copies of the manual can be obtained from the Heating, Piping and Air Conditioning Contractors National Association at 1250 Sixth Ave., New York 20, N. Y. The sale is restricted to members of the national association, to regularly indentured apprentices in the trade, to apprenticeship committees, to instructors of apprenticeship classes, and to vocational schools. The restriction is caused by wartime conditions which made a limited edition necessary, according to the HPACCNA.

Conserving Fuel with Industrial Insulation

A 24 p. booklet entitled Conservation of Fuel for War—Industrial Insulation with Mineral Products, by Oliver Bowles, is a reproduction of the Bureau of Mines' information circular 7263, printed by the Industrial Mineral Wool Institute as a contribution to the government's fuel conservation program.

Faced with the uncertainty of deliveries and insufficient stocks of fuel to assure continuous operation, this treatise on the importance of conserving fuel by reduction of heat loss from industrial equipment is timely and will prove particularly interesting to power and process plant engineers, company executives, and purchasing agents.

A full description of loose, granulated, blanket, block, board, and pipe covering types of mineral wool insulation is given with examples of equipment and places where each product may be used to obtain best results.

Reference to publications in the footnotes supplies information on current publications that are available for practical help in surveying plant equipment preparatory to correcting heat losses, and material and installation standards for mineral wool products. Description of other insulating materials and sales statistics for several years are also given.

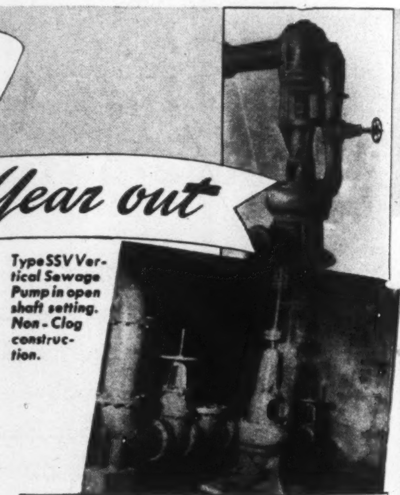
A free copy of this booklet will be supplied upon request, made on company letterhead, to the Industrial Mineral Wool Institute, 441 Lexington Ave., New York 17, N. Y.

● *The American Red Cross must raise a 1944 war fund of unprecedented size to meet unprecedented demands. Your contribution will assure maintenance of all Red Cross services and thus help to save many lives. Give now!*

Economy's Vertical Non-Clog Pump. Cap. 100 to 20,000 G.P.M. Heads to 200 ft.

TROUBLE FREE SERVICE

...Year in, Year out

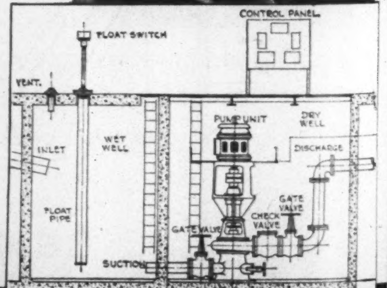


Type SSV Vertical Sewage Pump in open shaft setting. Non-Clog construction.

That's what you can expect, and will receive if you specify Economy's "Sure-Flow" Vertical Non-Clog Pump. Especially designed to pass solids, rags, sewage and trash *without vibration* or whip from shock of temporary unbalance by heavy objects entering the impeller. Motor is mounted in a yoke directly above the pump and *flexibly coupled* to the pump. The pump has its own heavy duty bearings and separate shaft. Economy Non-Clog Pumps are ideal for:

- Sewage Disposal
- Underpass Drainage
- Food Industries
- Chemical Industries
- Paper Mills
- Sludge Removal
- Overflow Service
- Reduction Plants

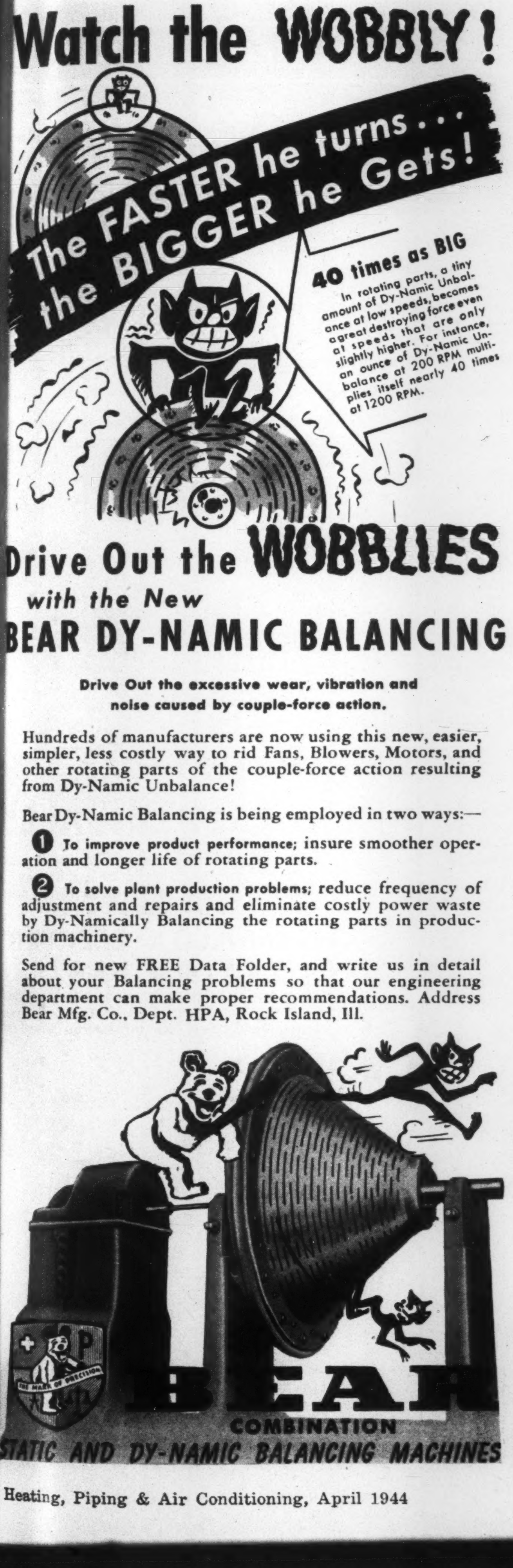
If your problems fall in any of these applications—write today for Bulletin F534. It tells a story well worth reading.



Typical installation of Vertical Non-Clog Pump in shallow well.

ECONOMY PUMPS, Inc.

HAMILTON, OHIO, U. S. A.



Watch the WOBBLY!

The FASTER he turns . . .
the BIGGER he Gets!

40 times as BIG

In rotating parts, a tiny amount of Dy-Namic Unbalance at low speeds, becomes a great destroying force even at speeds that are only slightly higher. For instance, an ounce of Dy-Namic Unbalance at 200 RPM multiplies itself nearly 40 times at 1200 RPM.

Drive Out the WOBBLIES

with the New

BEAR DY-NAMIC BALANCING

Drive Out the excessive wear, vibration and noise caused by couple-force action.

Hundreds of manufacturers are now using this new, easier, simpler, less costly way to rid Fans, Blowers, Motors, and other rotating parts of the couple-force action resulting from Dy-Namic Unbalance!

Bear Dy-Namic Balancing is being employed in two ways:—

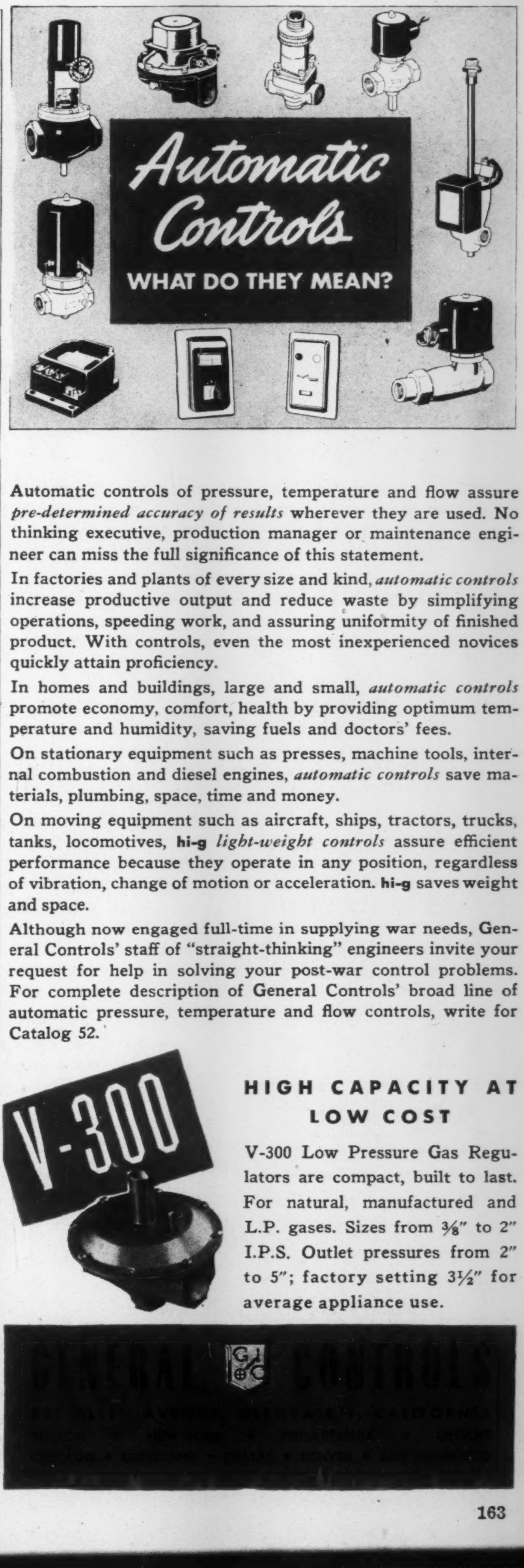
❶ **To improve product performance;** insure smoother operation and longer life of rotating parts.

❷ **To solve plant production problems;** reduce frequency of adjustment and repairs and eliminate costly power waste by Dy-Namically Balancing the rotating parts in production machinery.

Send for new FREE Data Folder, and write us in detail about your Balancing problems so that our engineering department can make proper recommendations. Address Bear Mfg. Co., Dept. HPA, Rock Island, Ill.

BEAR

COMBINATION
STATIC AND DY-NAMIC BALANCING MACHINES



Automatic Controls

WHAT DO THEY MEAN?

Automatic controls of pressure, temperature and flow assure *pre-determined accuracy of results* wherever they are used. No thinking executive, production manager or maintenance engineer can miss the full significance of this statement.

In factories and plants of every size and kind, *automatic controls* increase productive output and reduce waste by simplifying operations, speeding work, and assuring uniformity of finished product. With controls, even the most inexperienced novices quickly attain proficiency.

In homes and buildings, large and small, *automatic controls* promote economy, comfort, health by providing optimum temperature and humidity, saving fuels and doctors' fees.

On stationary equipment such as presses, machine tools, internal combustion and diesel engines, *automatic controls* save materials, plumbing, space, time and money.

On moving equipment such as aircraft, ships, tractors, trucks, tanks, locomotives, **hi-g** *light-weight controls* assure efficient performance because they operate in any position, regardless of vibration, change of motion or acceleration. **hi-g** saves weight and space.

Although now engaged full-time in supplying war needs, General Controls' staff of "straight-thinking" engineers invite your request for help in solving your post-war control problems. For complete description of General Controls' broad line of automatic pressure, temperature and flow controls, write for Catalog 52.

V-300

HIGH CAPACITY AT LOW COST

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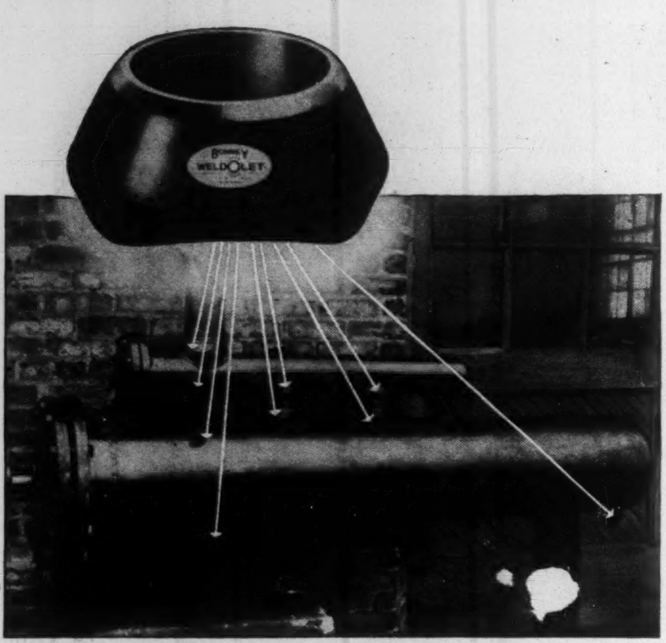

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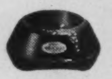

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No. 4666—56 p. bulletin (A-52) describing line of heav duty, two stage air cooled compressors for industrial plant mines, and heavy contracting, including two cylinder ve tical types, four cylinder semi-radial types, and twin unit having a common double shaft motor.—Sullivan Machiner Co., Michigan City, Ind.

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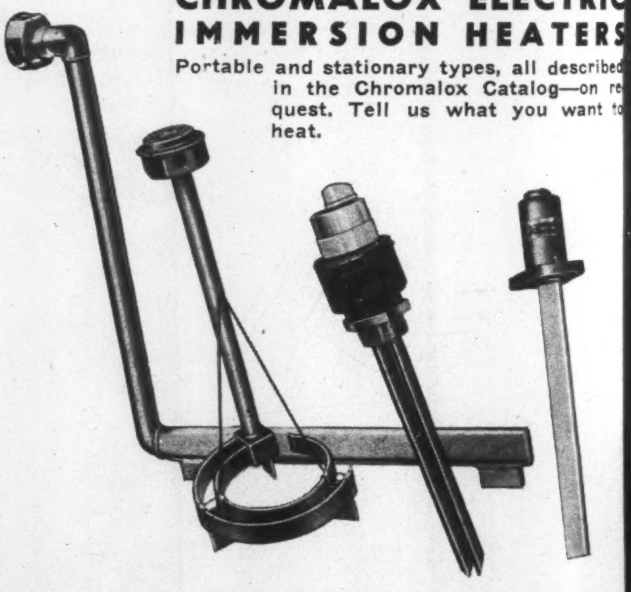

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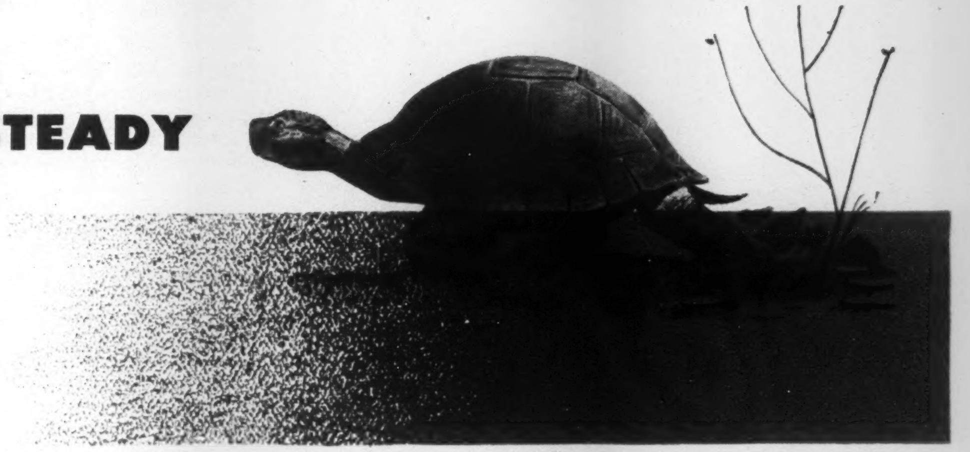

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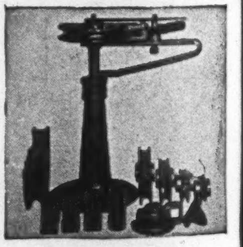

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No. 4674—16 p. issue of Dust Engineering (Vol. 5, No. 2) including information on how dust control speeds production, ventilated benches and booths, airplane engine filters, the "Electro-Matic" filter, the future of dust control, etc.—American Air Filter Co., Inc., 107 Central Ave., Louisville 8, Ky.

Electronic Motor Drives

No. 4675—Catalog sheet (175) describing electronic motor drives for operating direct current motors from 1 to 250 hp on alternating current lines, with precision speed control.—Electron Equipment Corp., 917 Meridian Ave., South Pasadena, Calif.

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OFF THE ROOF
WHEN
SEEKING HIGH
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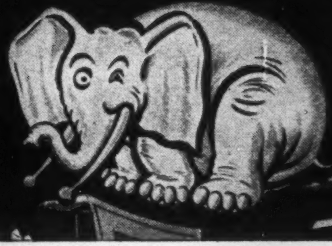

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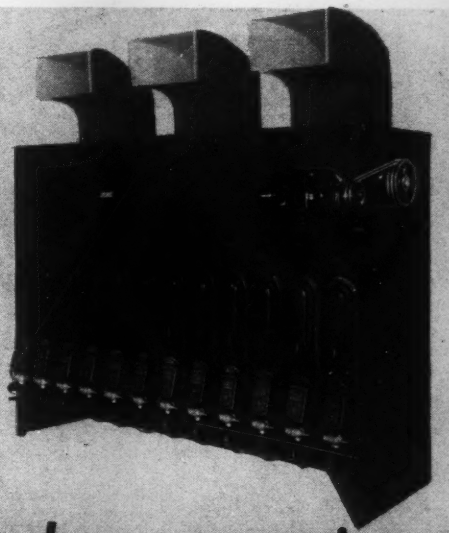

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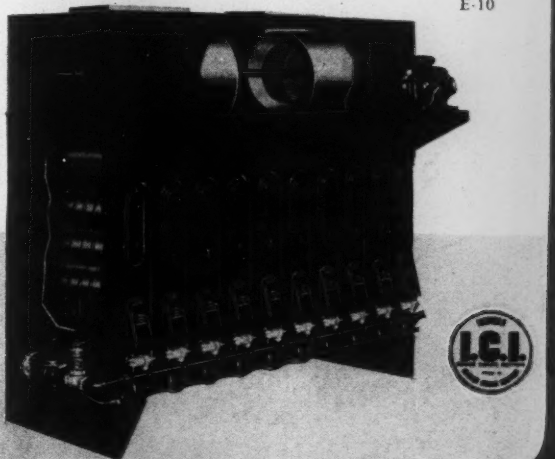

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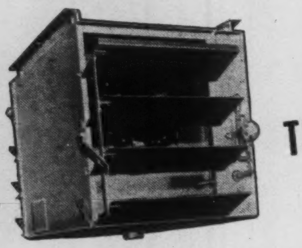

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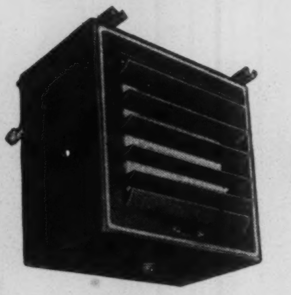

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No. 4677—6 p. bulletin (304) giving facts about rotary pumps, describing the swinging vane principle and method of operation.—Blackmer Pump Co., 1920A Century Ave., S. W., Grand Rapids 9, Mich.

Spray Nozzles

No. 4678—32 p. catalog (22) on spray nozzles and related equipment which has been designed as an engineering guide to the selection of the right nozzle for any purpose. Spray characteristics, dimensions, and performance data are given on a complete line of standard nozzles, and special purpose nozzles made of a variety of materials as well as accessories such as strainers and adjustable joints are also described. Written specifications on each nozzle are supplemented by capacity tables. There are also descriptions of humidifying assemblies, roof spraying systems, and cooling tower and spray pond assemblies.—Spraying Systems Co., 4031 W. Lake St., Chicago 24, Ill.

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No. 4679—384 p. catalog (280) on v belt drives, in convenient pocket size, designed for use by the engineer, designer, plant executive, and maintenance man as a ready reference manual. There are six major subject divisions on introduction and description, v belt drives for standard motor speeds, v flat drives, supplementary drive tables, engineering data on special drives, and a section on prices, dimensions, and interchangeability list. Careful consideration has been given to arrangement, convenience, and simplification of data for quick and easy drive selection.—Dayton Rubber Mfg. Co., 2345 W. Riverview Ave., Dayton 1, Ohio.

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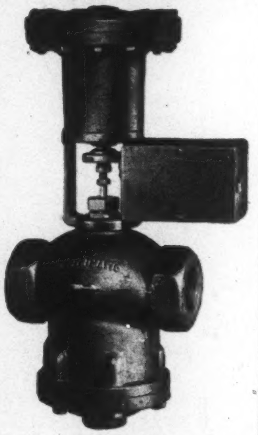

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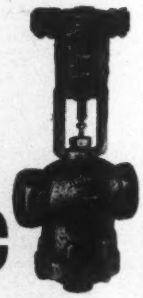

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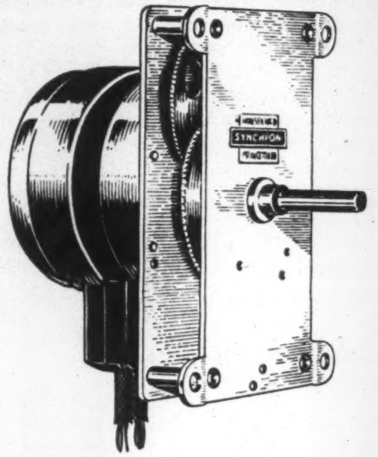

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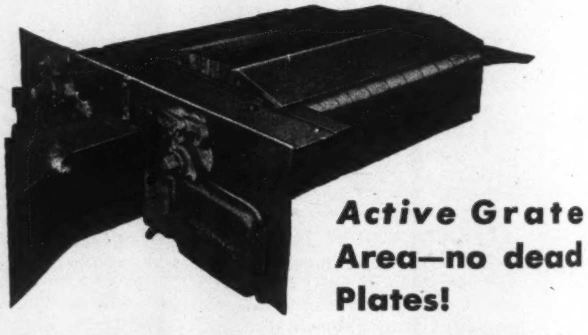

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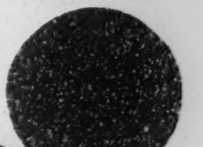

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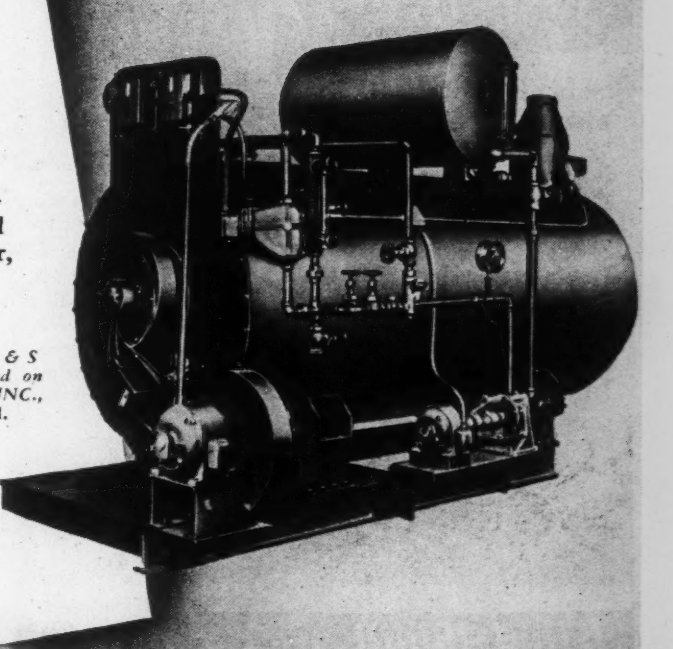

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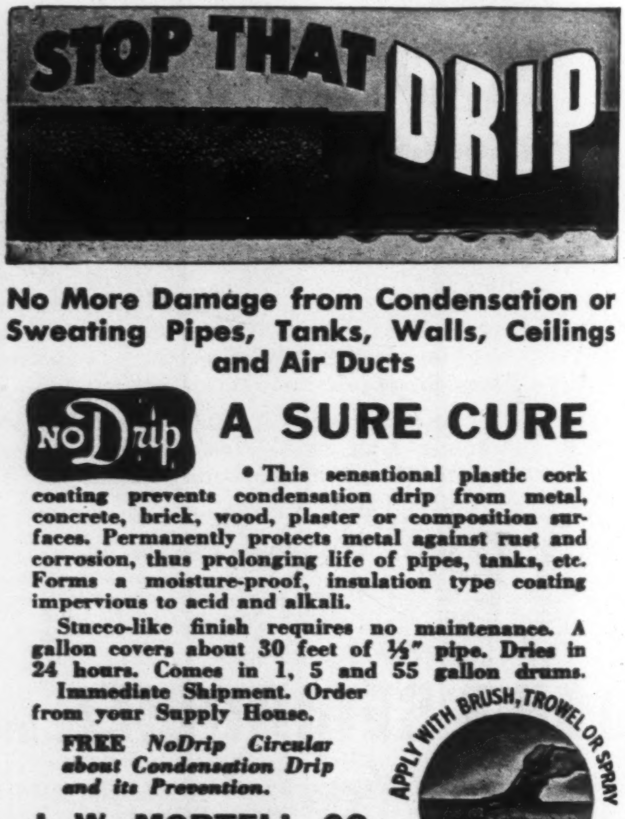
MEETINGS & CONVENTIONS

Power Conference

Midwest Power Conference, seventh annual conference, April 13-14, Palmer House, Chicago, Ill. Theme of the meeting is to be "power brings victory," and it is sponsored by Illinois Institute of Technology, with other schools and various societies cooperating. Program includes papers on experimental stress analysis methods, by C. O. Dohrenwend, Armour Research Foundation; causes and prevention of boiler priming and solids carryover, by W. H. Rowand, Babcock and Wilcox Co.; corrosion as a factor in piping maintenance, by L. G. Vande Bogart, Crane Co.; inhibitors in condenser tube alloys, by Austin R. Zender and C. L. Bulow, Bridgeport Brass Co.; research in fuels as a postwar necessity, by A. R. Mumford, Combustion Engineering Co.; postwar outlook for oil fuels, by Arch L. Foster, Oil and Gas Journal; statistical comparison of fuels, by C. C. DeWitt, Michigan State College; and closed evaporative coolers, by William Goodman, Trane Co. Conference director is Stanton E. Winston, Illinois Institute of Technology, 3300 Federal St., Chicago, Ill.

Heating, Piping, and Air Conditioning Contractors

Heating, Piping and Air Conditioning Contractors National Association, 55th annual convention, May 31-June 2, Hotel Statler, Cleveland, Ohio. A condensed, five session program will include discussions of training and testing welding operators, formation and operation of welding bureaus, home heating, selling heating, employer-employee relationships, and postwar plans for the industry. Secretary of the HPACCNA is Joseph C. Fitts, 1250 Sixth Ave., New York 20, N. Y.


STOP THAT DRIP

No More Damage from Condensation or Sweating Pipes, Tanks, Walls, Ceilings and Air Ducts

NoDrip A SURE CURE

• This sensational plastic cork coating prevents condensation drip from metal, concrete, brick, wood, plaster or composition surfaces. Permanently protects metal against rust and corrosion, thus prolonging life of pipes, tanks, etc. Forms a moisture-proof, insulation type coating impervious to acid and alkali.

Stucco-like finish requires no maintenance. A gallon covers about 30 feet of ½" pipe. Dries in 24 hours. Comes in 1, 5 and 55 gallon drums.

Immediate Shipment. Order from your Supply House.

FREE NoDrip Circular about Condensation Drip and its Prevention.

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ON THE HOME FRONT

Most of the widely used items of Petro Oil Burning Equipment are currently available for replacement and for authorized new installation under W.P.B. regulations and ratings. Where we cannot ship at once, the delay is usually nominal.

Petro equipment includes:

DOMESTIC "CONVERSION" BURNERS
1 to 6 gal. per hour

LARGER "LIGHT (No. 3) OIL" BURNERS
general application type
6 to 18 gal. oil per hour

COMBINATION BURNER-GENERATOR UNITS
both steel and C. I. sectional boilers; forced warm air units; and instantaneous water heaters.

INDUSTRIAL OIL BURNERS
Manual - Semi Auto - and Automatic* for either un-heated or pre-heated industrial oils, up to 145 g.p.h. Built-in motor or belt drive.

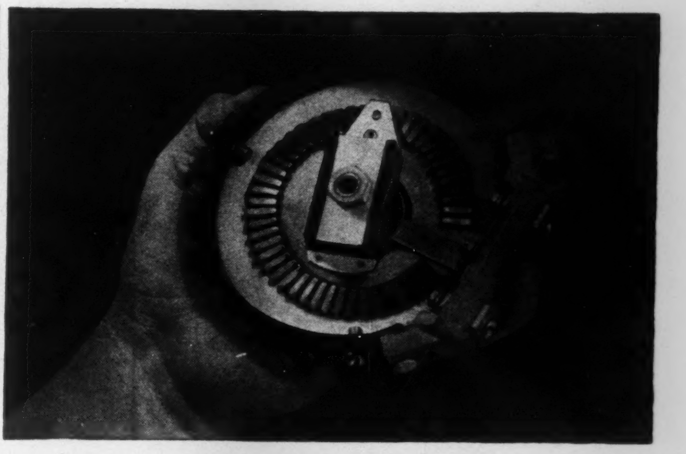
****When pre-heated oils are burned the Petro Thermal Viscosity system insures consistent maximum combustion efficiency at all firing stages, automatically and reliably.***

Petro Engineering co-operation is still available. Research-development is active. When your post-war activities start, Petro will be ready for you.

OIL IS AMMUNITION USE IT WISELY

Full data on Petro Industrial Burners are in our Catalog—see Sweet's or Domestic Engineering Catalog Files—or we will gladly send copies on request.

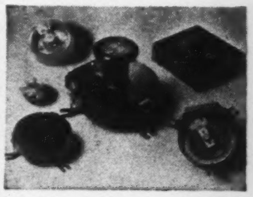
PETROLEUM HEAT AND POWER COMPANY
Makers of Good Oil Burning Equipment Since 1903
STAMFORD CONNECTICUT



A SMALL RHEOSTAT with *BIG* FEATURES

The fact that a Rheostat is small, in no way diminishes the importance of its functioning.

Ward Leonard recognizes this and has produced their 4″ Plate Type Rheostat with all the desirable features of their largest equipment. It dissipates heat from both sides. The contacts are solid metal blocks for durability. Action is smoothness itself. There are forty-three steps of control.



WL

RHEOSTAT BULLETINS

Bulletins are available describing the various Ward Leonard Rheostats. The line is complete including from the small ring types up to the heaviest duty, multiple mounted, power driven units. Write for data bulletins describing the type of Rheostats of interest to you.

ARMY E NAVY
ARMY E NAVY

WARD LEONARD

RELAYS • RESISTORS • RHEOSTATS

Electric control* WL *devices since 1892.

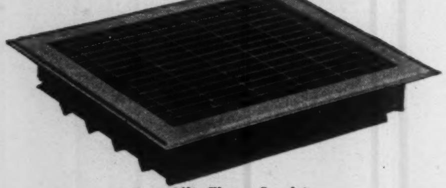
WARD LEONARD ELECTRIC COMPANY
31 SOUTH STREET MOUNT VERNON, N. Y.

WING REVOLVING UNIT HEATERS

Wing Revolving Unit Heaters insure uniform mixture and circulation of heated air by the use of discharge outlets which revolve slowly and project the streams of heated air to the working level sweeping around in a complete circle. As the moving air circulates along the working level, it mixes uniformly with the cold air, circulates around heavy machinery and obstructions and penetrates into cold, damp corners—insuring a comfortable uniform temperature throughout the entire plant. These Wing Revolving Heaters are suitable for all types and sizes of buildings because the deflectors on the discharge outlet can be adjusted to propel the air in two different concentric circles which permits coverage of a great area.

L. J. Wing Mfg. Co.

14th St. & 7th Ave., New York, N. Y.—Factories: Newark, N. J.



DuraBilt Floor Register

DuraBilt Floor Registers & Cold Air Faces

- ★ Cross-locked assembly for surplus strength and rigidity.
- ★ All-steel flat bars—mortised at joints, close fitted, perfectly aligned and level.
- ★ Face securely interlocked to frame by tenons at every connection.
- ★ Greater open capacity for air-flow.
- ★ Close mesh design ($\frac{7}{16}$" x $1\frac{15}{16}$" openings) to exclude french heels and small objects, ample for free air flow.

DuraBilt Cold Air Return

THE AUER REGISTER COMPANY, Cleveland, O.

AUER REGISTERS

& GRILLES · For Air Conditioning and Gravity

Stoker Manufacturers

Stoker Manufacturers Association, annual meeting, June 1-2, French Lick Springs, Ind. Headquarters office of the SMA is at 307 N. Michigan Ave., Chicago 1, Ill.

Refrigerating Engineers

American Society of Refrigerating Engineers, 31st spring meeting, June 5-7, Hotel William Penn, Pittsburgh, Pa. Subjects to be covered include frost zone psychrometry, hydrocarbon refrigerants, cold cathode lighting for refrigerated spaces, unstable heat flow, refrigeration in synthetic ammonia production, etc. Headquarters office of the ASRE is at 50 W. 40th St., New York 18, N. Y.

Smoke Prevention

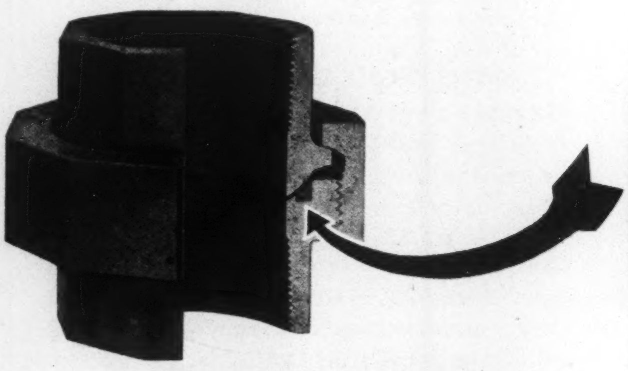
Smoke Prevention Association of America, annual meeting, June 6-9, Hotel Statler, Detroit, Mich. The influence that enforcement of smoke ordinances has on fuel conservation will be emphasized, and how smoke departments can cooperate in the national fuel efficiency campaign will be described. Headquarters office of the SPA is at 139 N. Clark St., Chicago 2, Ill.

Mechanical Engineers

American Society of Mechanical Engineers, semi-annual meeting, June 19-22, Hotel William Penn, Pittsburgh, Pa. Headquarters office of the ASME is at 29 W. 39th St., New York, N. Y.

District Heating Association

National District Heating Association, 35th annual meeting, June 20-21, Hotel William Penn, Pittsburgh, Pa. John F. Collins, Jr., 827 N. Euclid Ave., Pittsburgh, is secretary-treasurer of the NDHA.



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the standard of quality for over forty years.

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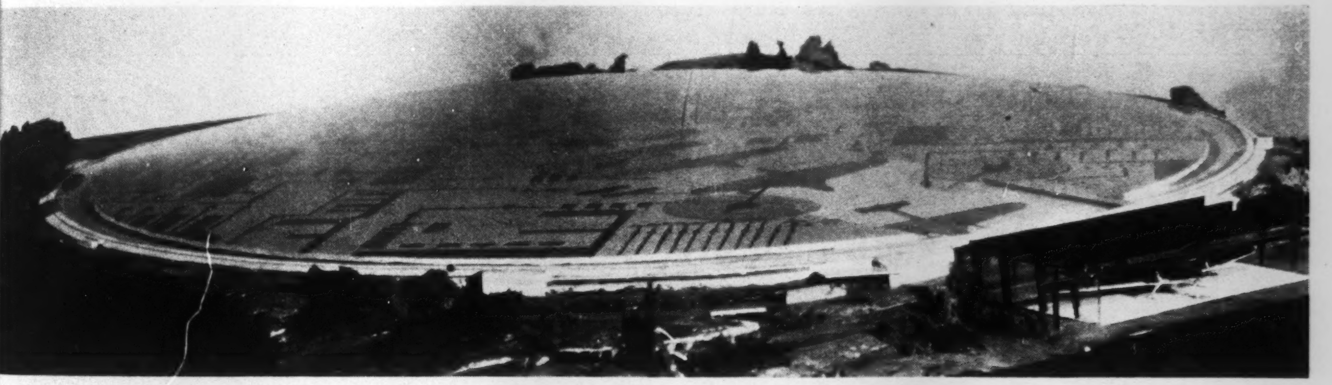
EQUIPMENT DEVELOPMENTS

For your convenience in obtaining more information about any of this equipment, see coupon on this page. Add the new products and companies listed here to your Directory Section which you received in your January 1944 Heating Piping & Air Conditioning and thus keep your records of sources of supply up to date throughout the year. Single asterisk indicates equipment not listed in Directory Section, and double asterisk equipment and manufacturer not listed. Coupon on this page may also be used to request copies of trade literature listed on pp. 205-208. If you write direct to the manufacturer, describe carefully the information you want; coupon numbers are for use when sending requests to HPAC.

Air Pressure from Fans Supports Novel Roof

No. 2587—A design for an air supported roof for industrial buildings, using pressure developed by ventilating fans, has been worked out by Herbert H. Stevens, Jr., research and development engineer, and Alfred Bush, designer, 1270 Sixth Ave., New York 20, N. Y. The roof consists of a thin steel membrane anchored to a circular concrete ring either on the ground or supported by columns.

According to Mr. Stevens, the use of ventilating fans to support the roof is possible because of the very low pressures necessary. One ounce per square inch (about 1¾ in H_2O) exerts 9 lb per sq ft or about 5000 tons on a 1200 ft diameter roof, the size represented by the model shown here. The ventilating fans can supply this pressure and increase it as necessary in the case of snow loads by controls sensitive to the height of the roof.



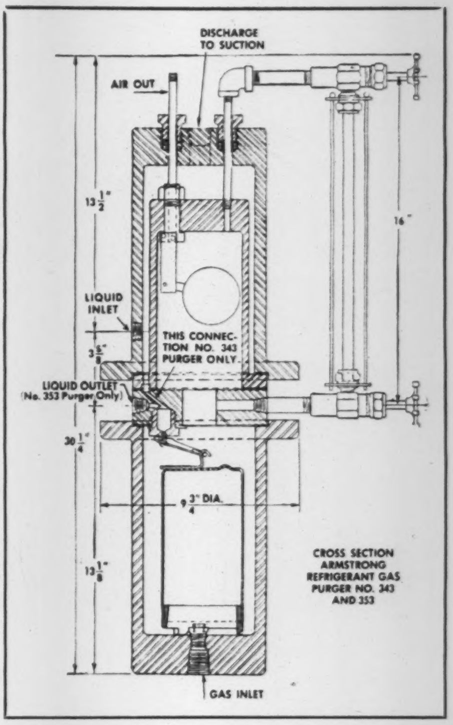
The pressure will be maintained by airlocks and revolving doors although direct openings to the outside are permissible for short times. The positive pressure maintained inside the dome will keep out cold drafts, dusts, etc. A simple piping system to the outside will provide a convenient exhaust system for hoods, air contaminating equipment, etc., without individual blowers. The positive pressure will also provide means for forcing out exhaust air through interchangers to warm incoming air and perhaps to drive air turbines to help pump in fresh air.

The use of the ventilating fans to provide support for the roof will eliminate a tremendous amount of structural steel and provide a floor space free of columns and other obstructions, which is very desirable in many types of buildings, says Mr. Stevens.

Small buildings can be constructed by mounting the anchor ring on columns and using side walls as in ordinary buildings. These buildings may be of various shapes and will have the large central part free of columns.

The roof of the model is transparent to show the interior laid out as an aircraft factory. It was photographed by Arthur Muray.

Refrigerant Purger



CROSS SECTION ARMSTRONG REFRIGERANT GAS PURGER NO. 343 AND 353

No. 2588 — A forged steel purger for removing air and other non-condensable gases from refrigerating systems has been designed for high pressure CO_2, ammonia, and "Freon" systems and for service where engineers prefer all steel construction. Hooked up to both the condenser and receiver, the manufacturer states it keeps the system free of noncondensables with no appreciable loss of refrigerant gas. Refrigerant purgers of cast semi-steel construction are also available.—Armstrong Machine Works, 874 Maple St., Three Rivers, Mich.

Indoor-Outdoor Weather Controls

No. 2589**—Three new models of indoor-outdoor weatner controls for multi-family residential buildings, and large

Heating, Piping & Air Conditioning, [5-44]
6 N. Michigan Ave., Chicago 2, Ill.

Please ask the manufacturers to send me more information about the equipment mentioned under the following reference numbers in Equipment Developments and Recent Trade Literature.

(Circle each number in which you are interested)

2587 2588 2589 2590 2591 2592 2593 2594 2595 2596
2597 2598 2599 2600 2601 2602 2603 2604 2605 2606
2607 2608 2609 2610 2611 2612 2613
4683 4684 4685 4686 4687 4688 4689 4690 4691 4692
4693 4694 4695 4696 4697 4698

Name.............................. Title............

Company ....

Address ....

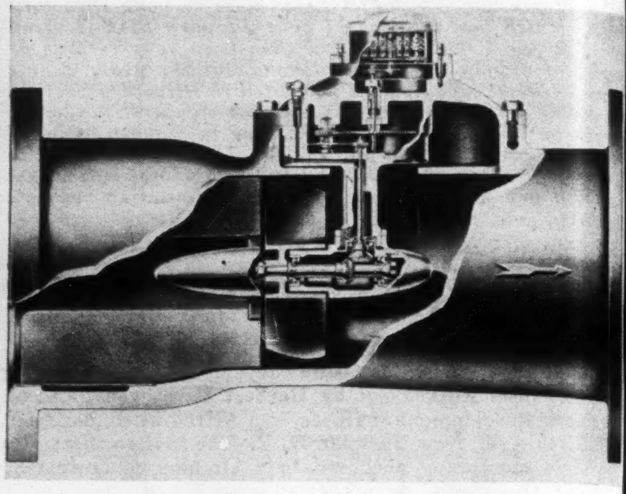
City............................ State............

HEAT TIMER
CORPORATION
PAT. PEND.
RED ON — Outside element calls for heat
RED & GREEN — Outside element calls for heat and heat circulation is established
RED OFF — Outside element satisfied
GREEN OFF — Off period of cycle is completed
SELECTOR
HEAT

commercial installations are designed for hand fired coal, oil fired, and stoker fired boilers. These "Heat Timers" are electrically operated at 24 volts and include an outdoor element and indoor element attached to either the system or the boiler, and a control panel which may be mounted at any distance from either the outdoor or indoor elements. An innovation in the control is the requirement that circulation must be established completely in the building before the timing cycle starts.—Heat-Timer Corp., 160 Fifth Ave., New York, N. Y.

Propeller Type Flow Meter

No. 2590—A new propeller type flow meter for main lin metering incorporates streamline venturi construction. Known as the "Propeloflo" meter, it has an eight blad bakelite propeller molded in one piece; rotation is transmitted through spur and bevel gears, and shafts rotating i ball bearings assure maximum power to drive indicating an



recording devices or proportioning chemical feeders. It has a one shot lubrication system, readily accessible stuffing box, and the propeller mechanism may easily be removed from the line for inspection. Where debris or heavy foreign material may be carried along in the line, a section of pipe having a coarse screen and hand hole to be inserted upstream from the meter can be provided. For use in lines 6 in. and larger.—Builders-Providence, Inc., Div. of Builders Iron Foundry, 9 Codding St., Providence 1, R. I.

Our Mark of Merit . . Your Sign of Service
. . . more than ever you'll want the things it stands for

LEADERS IN VALUE·SERVICE
Schaible
PROGRESS·DEPENDABILITY

VALUE: Higher quality at attractive price means better value . . . better profits. Schaible Values are never excelled . . . rarely matched. True in war or peace, Schaible products are leaders in better value.

SERVICE: Schaible's devotion to customer service has been proved more than ever during the war . . . through all the difficulties. You can count on still better service under normal circumstances.

PROGRESS: The latest in design, engineering, materials, and methods will always be reflected in Schaible products. Aggressive, far-sighted management further assures that no plant or organization will be better equipped to meet your needs.

DEPENDABILITY: Company character in performance of duty . . . to the industry and every customer . . . are of first importance to Schaible. Our reward is the rapidly growing dependence on and confidence in us by the trade.

The Schaible Company · Cincinnati, Ohio
MAKERS OF QUALITY BRASS GOODS. STOCKED BY [illegible] WHOLESALERS EVERYWHERE

FORMULA *for* VICTORY

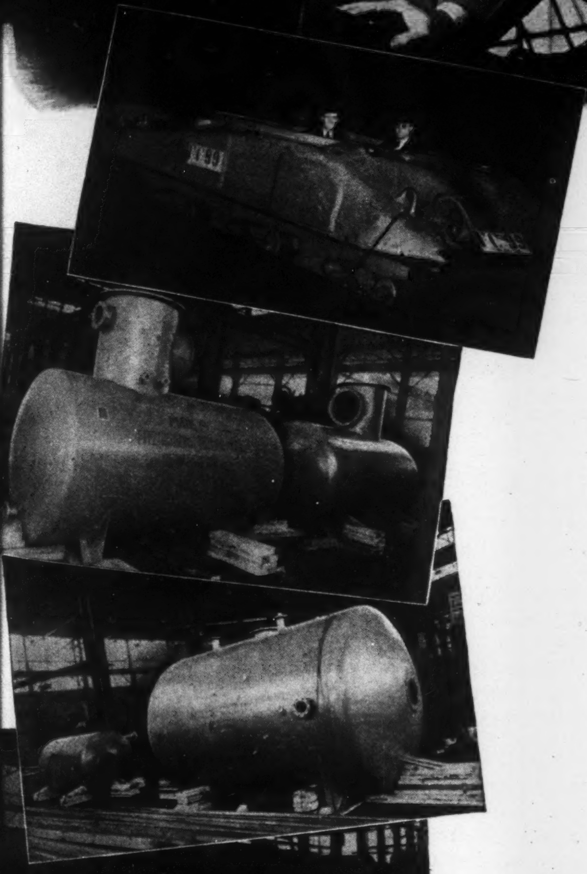


Photo by Office of War Information, Overseas Picture Division. Photographer, Miss Collins.

UNITY OF PURPOSE – see it expressed in the photo above. Representing industrial management, Homer Addams, the shirt-sleeved, hard-working President of Fitzgibbons Boiler Company, Inc. . . . Two inspecting officers of the Allied armed forces . . . And to represent the might of America's mechanical skill, a welder who has just finished the last seam on the hull of a General Sherman tank. All in the same casually grouped, unposed picture taken in the Fitzgibbons plant.

Fitzgibbons is a steel boiler making plant—or rather it *was,* and *will* be again. Right now, with the amazing adaptability of American industry, it is a production center for combat tanks, tank-destroyers, naval gun shields, locomotive boilers, heat transfer apparatus for wartime process work, and other equally vital material, now serving on practically every fighting and industrial front on the globe.

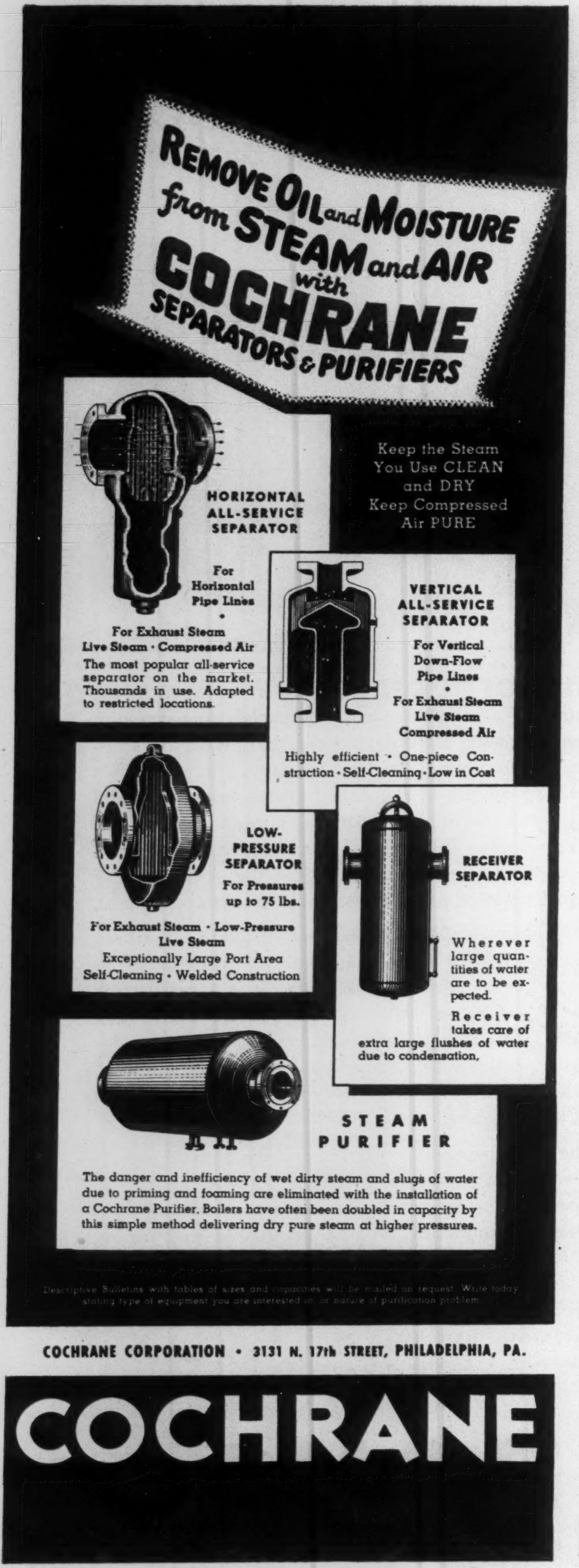
The organized skill to build this equipment rapidly and well, is based upon almost sixty years of Fitzgibbons progressive development, just as the experience gained in present production will be invaluable in building the Fitzgibbons steel boilers of tomorrow.

FITZGIBBONS BOILER COMPANY, INC.
101 PARK AVENUE, NEW YORK 17, N. Y.
Works: OSWEGO, N. Y. • *Branches in Principal Cities*

ARMY E NAVY

FITZGIBBONS
STEEL HEATING BOILERS SINCE 1886

BUY WAR BONDS and STAMPS


REMOVE OIL and MOISTURE from STEAM and AIR with COCHRANE SEPARATORS & PURIFIERS

Keep the Steam You Use CLEAN and DRY
Keep Compressed Air PURE

HORIZONTAL ALL-SERVICE SEPARATOR
For Horizontal Pipe Lines
•
For Exhaust Steam
Live Steam · Compressed Air
The most popular all-service separator on the market. Thousands in use. Adapted to restricted locations.

VERTICAL ALL-SERVICE SEPARATOR
For Vertical Down-Flow Pipe Lines
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For Exhaust Steam
Live Steam
Compressed Air
Highly efficient · One-piece Construction · Self-Cleaning · Low in Cost

LOW-PRESSURE SEPARATOR
For Pressures up to 75 lbs.
For Exhaust Steam · Low-Pressure Live Steam
Exceptionally Large Port Area
Self-Cleaning · Welded Construction

RECEIVER SEPARATOR
Wherever large quantities of water are to be expected.
Receiver takes care of extra large flushes of water due to condensation.

STEAM PURIFIER
The danger and inefficiency of wet dirty steam and slugs of water due to priming and foaming are eliminated with the installation of a Cochrane Purifier. Boilers have often been doubled in capacity by this simple method delivering dry pure steam at higher pressures.

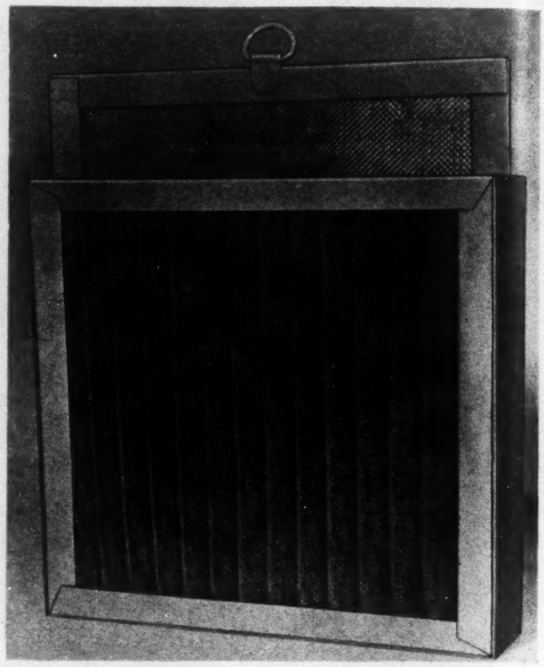
Descriptive Bulletins with tables of sizes and capacities will be mailed on request. Write today stating type of equipment you are interested in, or nature of purification problem.

COCHRANE CORPORATION • 3131 N. 17th STREET, PHILADELPHIA, PA.

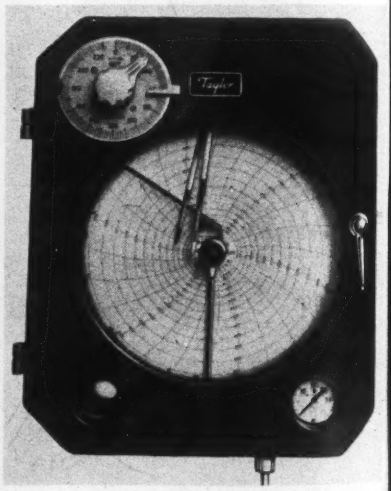
COCHRANE

Oil Separator Filter

No. 2591—Fire hazard, health hazard, and nuisances caused by oil thrown into the air during many industrial processes can be eliminated by the use of a new oil separator filter. Installed in the ventilating system it removes oil, kerosene, etc., entrained in the air, says the manufacturer, but does not, it is pointed out, remove oil, smoke, or liquids in a true vapor state. The unit consists of a permanent viscous impingement filter for removing dirt and dust, and a removable oil collecting media to trap remaining liquid particles.—Air-Maze Corp., 5200 Harvard Ave., Cleveland 5, Ohio.



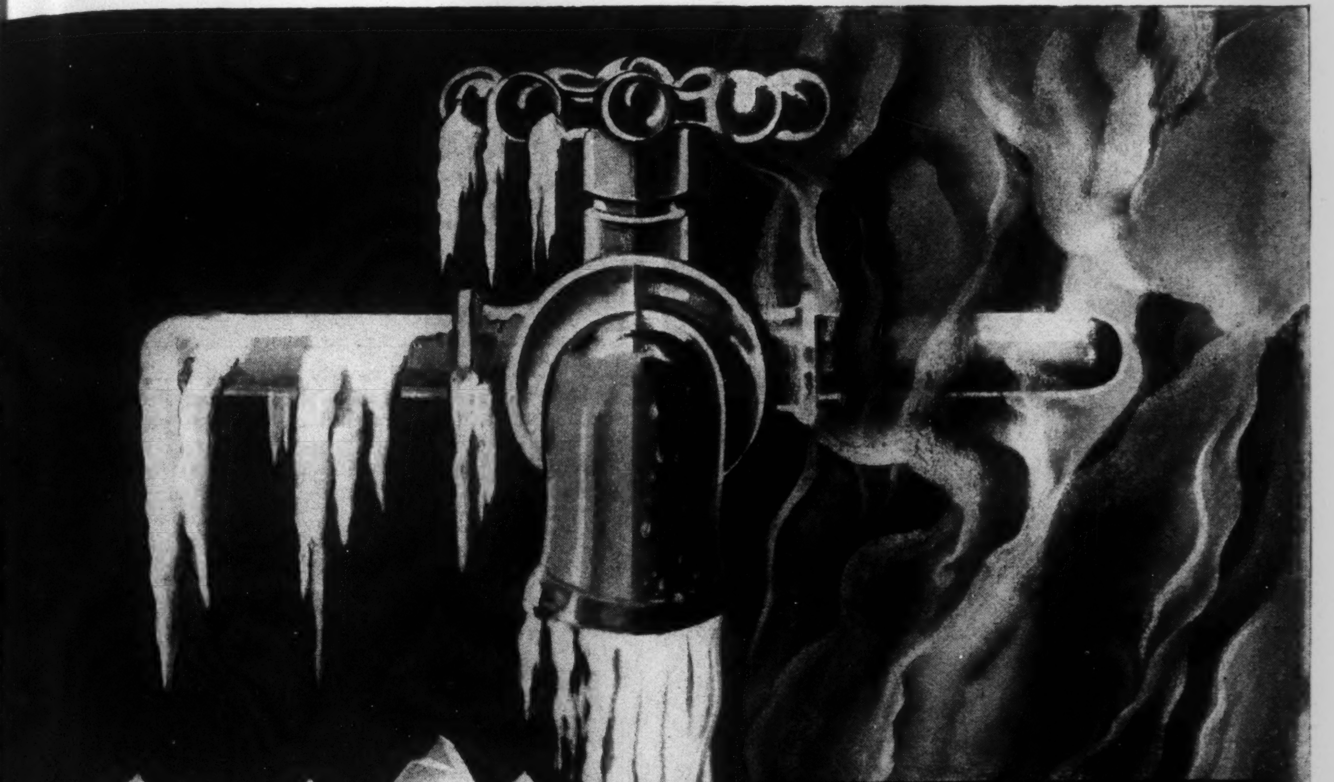
Process Timing Mechanism

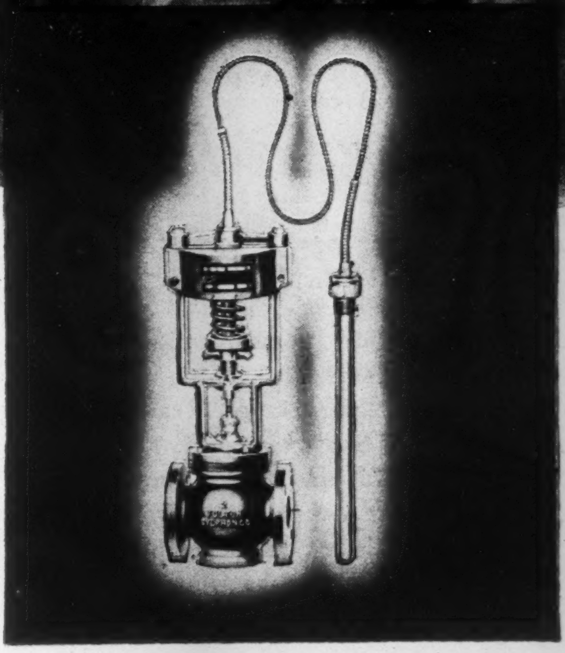


No. 2592 — The process timing mechanism for "Fulscope" temperature or pressure controllers, production of which was suspended soon after the beginning of the war, is again available, says the manufacturer. This device is used in such process industries as canning, vulcanizing, etc., where the quality of the product depends upon positive time control of either temperature or pressure. The process is started manually by adjusting the instrument for the desired time period and timing begins, not immediately, but when the apparatus reaches the desired control point.—Taylor Instrument Companies, 95 Ames St., Rochester 1, N. Y.

Two-in-One Valve

No. 2593—Designed for either high pressure drop and small volume, or low pressure drop and large volume, the dual purpose butterfly valve illustrated features close con-





EITHER TOO HOT OR TOO COLD?

When you open the hot-water faucet you don't want cold water . . . neither do you want to scald yourself. You want water very close to 180°F., and if the temperature goes much above this, fuel is wasted and lime deposits form on the pipes. If the water temperature drops much below 180°F., it just isn't hot enough, and "blocked open" faucets create waste.

Fulton Sylphon Storage Water Heater Regulators solve the problem, and maintain a constant temperature even during peak periods. Their fully modulating action compensates for the slightest rise or fall of water temperature.

Sylphon Temperature Regulators are manufactured in a wide variety of standard types. In addition, instruments to meet special conditions may be designed. Send for Bulletin JH-20.

No. 931 Temperature Regulator. This instrument is widely used to maintain temperatures in hot-water storage tanks. Also used in industrial processes where one definite temperature is required from day to day.

FULTON SYLPHON

[illegible]

ACHIEVEMENT

that challenges future effort

Promises are just promises unless kept; but performance is history. That's why we are proud of our Army-Navy "E" award. It expresses Uncle Sam's recognition of our contribution to this nation's production record . . . a performance that will live in history. As such, our "E" is not only a symbol of a vital job well done but an inspiring challenge to the men and women of General Controls. ★ We pledge ourselves to continue giving our best, and more, to produce Automatic Controls for America's needs. Today, tomorrow and until "V" Day, we will continue to earn our "E" by *performance.*

hi-g
GENERAL CONTROLS

Wartime Manufacturers of Electro-Magnetic and Temperature Controls for Aircraft

Peacetime Manufacturers of Automatic Pressure Temperature, and Flow Controls

801 ALLEN AVENUE, GLENDALE 1, CALIFORNIA
BOSTON • NEW YORK • PHILADELPHIA • DETROIT • CHICAGO
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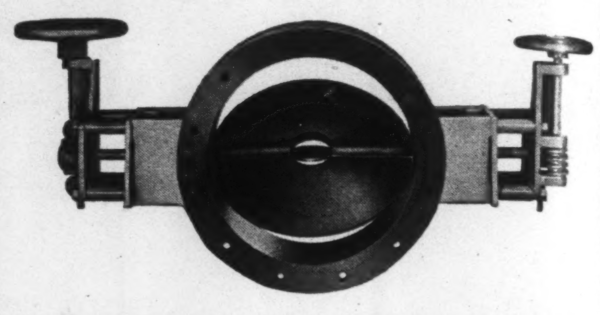
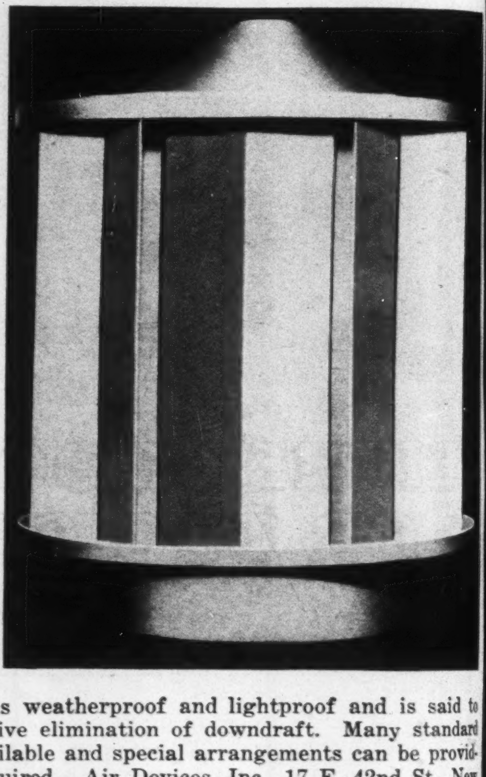


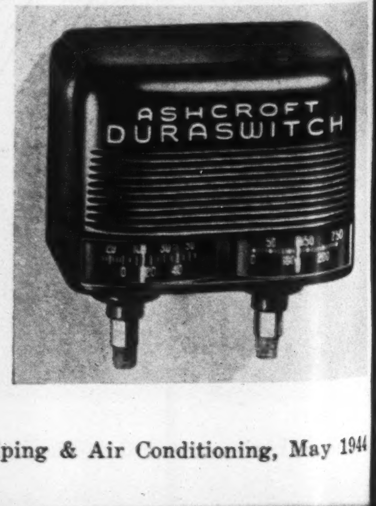
trol. It is easily adapted to power operation. The larger beveled vane seats against the body of the valve while a smaller vane is free revolving. Four to six revolutions of the handwheel completely open or close either valve vane. Available in various combinations and sizes for operating pressures of 15 to 900 psi.—R-S Products Corp., Germantown Ave. at Wayne Junction, Philadelphia, Pa.

Wind Actuated Exhauster



No. 2594—The new wind actuated "Agitair" exhauster illustrated "gives positive ventilation regardless of wind direction or velocity" and is suitable for gravity and mechanical or exhaust systems in marine, industrial, and commercial applications. It is weatherproof and lightproof and is said to provide positive elimination of downdraft. Many standard sizes are available and special arrangements can be provided where required.—Air Devices, Inc., 17 E. 42nd St., New York 17, N. Y.

Switch and Gage Combination



No. 2595—The new "Ashcroft Duraswitch" is a switch in combination with a gage, the gage having a slide rule dial easily readable for accurate adjusting of the switch to the control point. The combination saves space on equipment, eliminates extra fittings, saves on installation, and improves appearance, says the maker. One series is for pressure only, and the

HEY WANTED A SYSTEM TO DO TWO THINGS WELL—

1—to Deliver Clean, Warm Air
2—to Evacuate Vapors and Spray Dust

Here is an excellent example of the flexibility of application offered by Dust-Stop* Air Filters.

The engineering problem involved two distinct filtering operations. Warm air was required to speed the paint drying—and, of course, this air had to be free of dust particles. Then there was the problem of exhausting vapors and spray dust from the spraying room.

Banks of Dust-Stop Air Filters on the exhaust side of aircraft paint room. Engineered and installed by The De-Vilbiss Company, Toledo, Ohio.

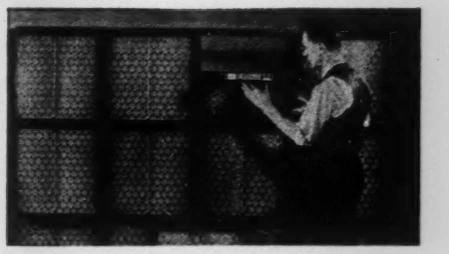
The first phase was designed to handle 45,000 CFM from a vertical plenum chamber for distribution across the spray room. On the opposite wall three vertical banks of Dust-Stop Air Filters, each handling 45,000 CFM, were provided to catch spray dust and to exhaust the vapors.

Each unit could be controlled separately or the entire system could be operated as a team.

In other words, it was designed so that the exhaust system could operate effectively; and in warm weather it was not necessary to supply warm-air heat. The blower and exhaust units could then be operated for ventilating purposes only.

Dust-Stops are also used in the central systems of manufacturing plants of all kinds, hotels, restaurants, department stores, and theaters. Standard cells may be built up to meet capacity and space requirements.

OWENS-CORNING
FIBERGLAS CORPORATION
Toledo 1, Ohio, Fiberglas Canada, Ltd.,
Oshawa, Ont.



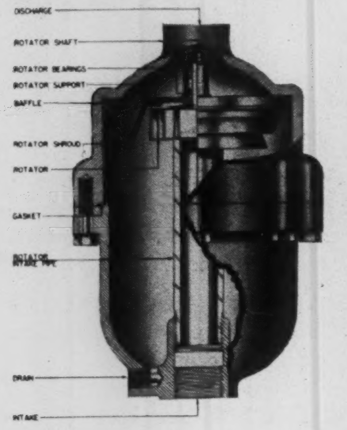
Dust-Stops for central systems comprise individual parts for each cell: frames, bolts, nuts, gaskets, and filters complete and ready for assembly.

FIBERGLAS* DUSTOP AIR FILTERS

*T. M. Reg. U. S. Pat. Off.

series illustrated is for both pressure and temperature applications, as a pressure control and pressure gage combination, or temperature control and thermometer combination, in single or duplex types.—Ashcroft Gauge Div., Manning, Maxwell & Moore, Inc., Bridgeport 2, Conn.

Compressed Air Purifier



No. 2596—New "Turbo-Rotor Pur-O-fier" makes possible positive purification of compressed air at any volume or pressure, according to the manufacturer, and eliminates moisture, scale, and oil. Air entering the unit from the intake pipe rotates a high speed balanced rotor which "beats the atomized moisture and vaporized oil into larger particles which are driven outward and downward by a shroud." Openings at the top of the shroud discharge purified air. Models for 10 to 35 cu ft and 35 to 100 cu ft are available and multiple installations may be made.—Bird-White Co., 3119 W. Lake St., Chicago, Ill.

Production Shear

No. 2597—The "Di-Acro" shear illustrated incorporates such features as precision adjustment for accurately stopping the blade travel which permits the shear to be readily arranged for a large variety of slitting and notching to extremely close tolerances, according to the manufacturer. A metal stripping guide moving with the shear blade is mounted on the unit which allows the shear to be employed

for stripping all types of materials to extremely narro widths. A delivery chute built in the unit delivers all ma terials, fabrics, and tissues "at any speed within the abilit of the operator to feed the shear." Maximum shearin width is 12 in. and maximum shearing capacity, full width is 18 gage steel plate, with heavier gages of other metals and materials in proportion.—O'Neil-Irwin Mfg. Co., 31 Eighth Ave., S., Minneapolis 15, Minn.

Electric Contact Heating

No. 2598—New electric contact heating units develope for military purposes are expected by the manufacture to be adaptable to a multitude of peacetime uses. The can be made in any size, contour, or capacity. It is state they have the advantages of light weight, operation a low wattage, and being safe in the presence of explosive

PROSPECTS ALL AROUND YOU for
FREEMAN STOKERS
FIRST CHOICE OF AMERICA'S FOREMOST HEATING ENGINEERS

HELP THE NATIONAL FUEL CONSERVATION PROGRAM . . .
BUILD A PERMANENT, PROFITABLE STOKER BUSINESS!

A Pioneer of the Stoker Industry . . . One of the Leaders in National Sales Volume . . .

Now that stokers have been approved for installation in hand-fired plants burning as low as 25 tons of coal per year, you have a greater-than-ever sales opportunity in the apartment-commercial-industrial market. Go after these prospects aggressively with Freeman! You'll be aiding the government's fuel conservation program . . . and getting set for the future in your own permanent, profitable stoker business at the same time. Freeman, a pioneer of the stoker industry and one of the leaders in national sales volume, is preferred and sold by America's foremost heating engineers. Freeman should be *your* first choice, too! Inquire about your territory . . . today.

Complete Range of Sizes: 65 to 1200 Pounds Per Hour

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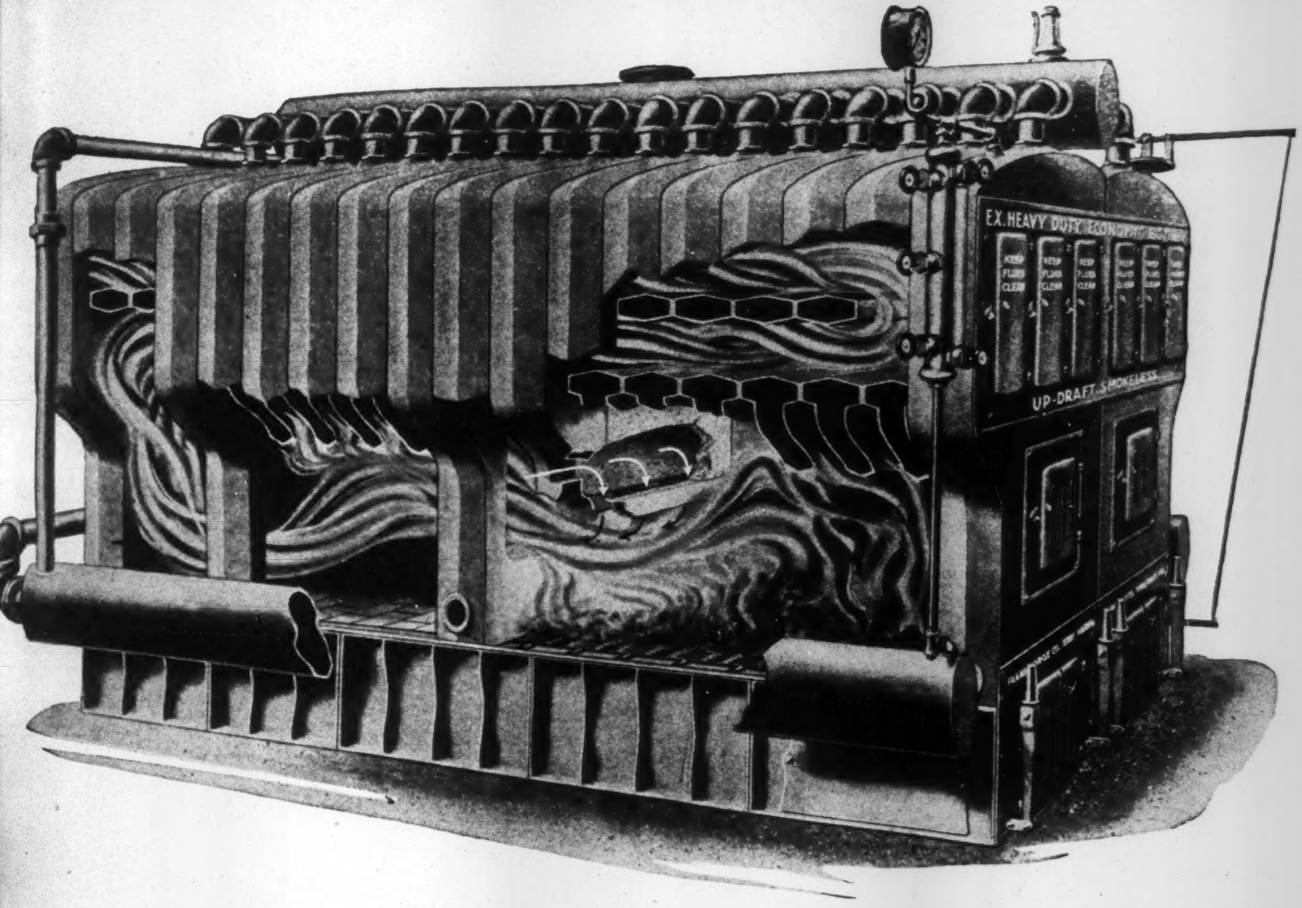

Smokeless, Economical Performance

WHERE Prox Boilers are installed they meet every requirement of the most rigid anti-smoke codes. They are really smokeless and that means, of course, more efficient and economical operation.

Prox Boilers do not require skillfull and excessive attention—an important factor in these days of manpower shortage. When you install Prox Boilers, therefore, you gain two important advantages: smokeless performance, minimum operating and maintenance attention.

You also get famous Prox rust resisting cast iron construction for long life; large water capacity for safety; easy assembly and installation; perfect balance in every detail of design for highest fuel economy; guaranteed ratings; low first cost.

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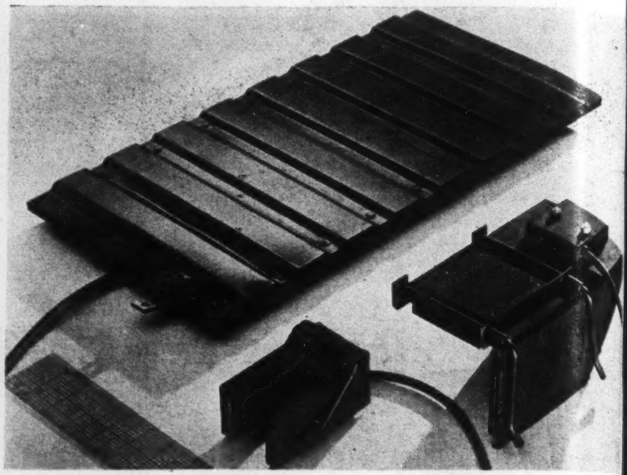
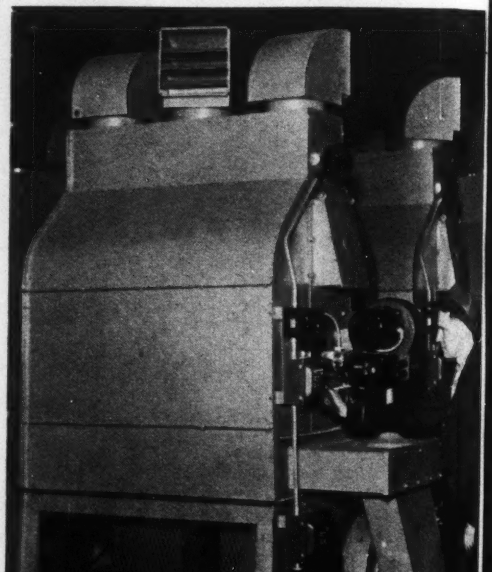


vapors. Current consumption ranges from 35 to 400 watts in the various sizes and shapes of units so far developed. Newly developed methods of insulating and housing the heating element are used. The face of the heating plate is held in compressive resilient contact against the surface. —H. & A. Company, 86-100 Leroy Ave., Buffalo 14, N. Y.

Direct Fired Air Heater

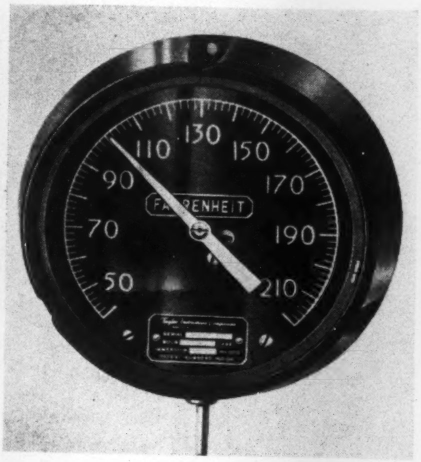


No. 2599—To meet the problem of heating small structures or to provide additional heat for limited areas, a small model of the manufacturer's direct fired heater with capacities ranging from 300,000 to 850,000 Btu per hr output has been developed. Overall size has been reduced so that floor space requirements are 5¼ x 3 ft, or the unit can be suspended from the wall where floor space is not available. It can be equipped to burn either gas or oil, and burners may be interchanged as conditions direct. The heater is thermostatically controlled.—Dravo Corp., Machinery Division, Heater Department, 300 Penn Ave., Pittsburgh, Pa.

Sight Flow Indicator

No. 2600—A new line of sight flow indicators was recently announced for installation in piping systems to enable the operator to determine whether or not fluid is flowing and to observe it. There are several types. One model has a hinged flapper which springs outward and upward to register passage of the fluid. A drip lip type has a visible lip arranged to register small or intermittent flow. There are also indicators for opaque flows or with electric contacts to actuate external alarm devices, and a wheel type with urbine blades that immediately shows low flows and hanges in flows.—Fischer & Porter Co., 973 County Line Rd., Hatboro, Pa.

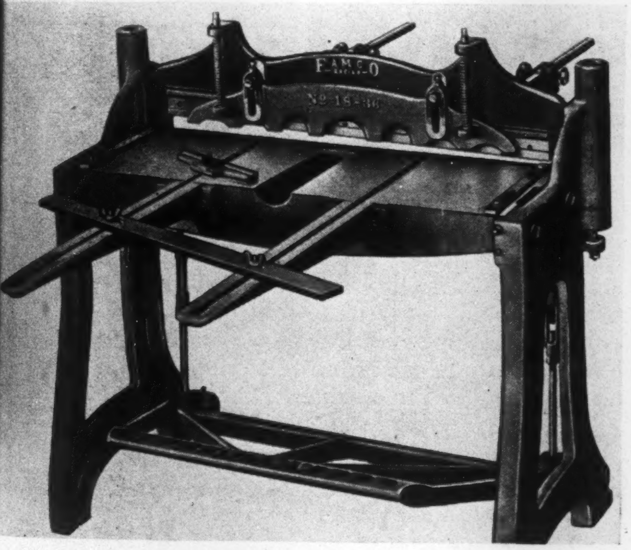
Dial Thermometer with Plastic Case



No. 2601 — Orignally built for the hipbuilding industry, new 4½ in. henolic case dial hermometer has numerous other applications. It is a mercury actuated instrument, built to withstand severe perating conditions, and, according to the manufacturer, is especially suited to installations requiring a long length of ubing between the bulb and the instrument. A wide variety of standard temperature sensitive bulb constructions is available in several emperature ranges.—Taylor Instrument Companies, 95 Ames St., Rochester 1, N. Y.

oot Operated Sheet Metal Shears

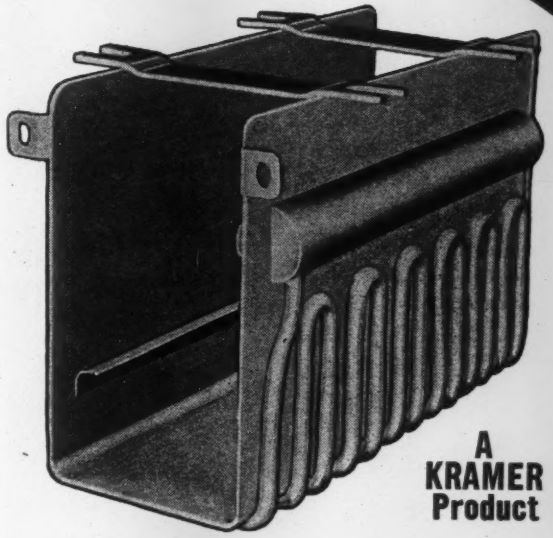
No. 2602**—A new line of foot operated sheet metal hears incorporates "several features long sought in a comact cutting machine." It is constructed of semi-steel, trategically reinforced and accurately machined. Five widths are available—22, 30, 36, 42 and 52 in.—the last three eing furnished with a "hold-down" attachment to hold tock in place as it is being cut.—Famco Machine Co., Racine, Wis.



Cold Bender for Finned Tubing

No. 2603—A compression type bender for finned tubing has made close to one million bends to meet Navy inspection, says the manufacturer. In one series of bends, 10 return bends were put in to one length of tubing to a tolerance of plus 0, minus ⅛ in.; in other words, the center-to-center measurement from the first run to the 10th run had a tolerance of scale plus 0, minus ⅛ in. Furthermore, a straight edge placed along the apexes of both sides had a tolerance of the scale plus 0, minus ⅛ in. And lastly, a straight edge placed along the extreme end of all the fins showed a tolerance of scale plus 0, minus ⅛ in. The great difficulty in making a power bender to do this work lay in the close clearances involved. The end of the fins

Back in Production!



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● A cooling unit designed to replace porcelain evaporators. Easy to install. Hanger brackets and all other fittings made to fit the same as before. Original ice trays and defrost dishes can be used with these replacements. (No grids or trays furnished).

Made sturdy, of heavy copper sheets and ⅜" continuous copper tubing, connections all silver-soldered, electrotin plated. May be used to replace many other models. Can be used with highside float or a thermostatic expansion valve.

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KRAMER TRENTON Co. TRENTON 5, N. J.

WECO-N. G. E. Series F600 GAS BURNERS

These burners are available for ratings from 50,000 to 10,000,000 B.t.u. output, for use in heating boilers, power boilers—in any metal firebox or sectional boiler.

Featuring flexibility to meet various firebox shapes and sizes at various gas pressures, and low draft loss. Full automatic controls that operate properly can be easily applied.

GUARANTEED VIBRATIONLESS

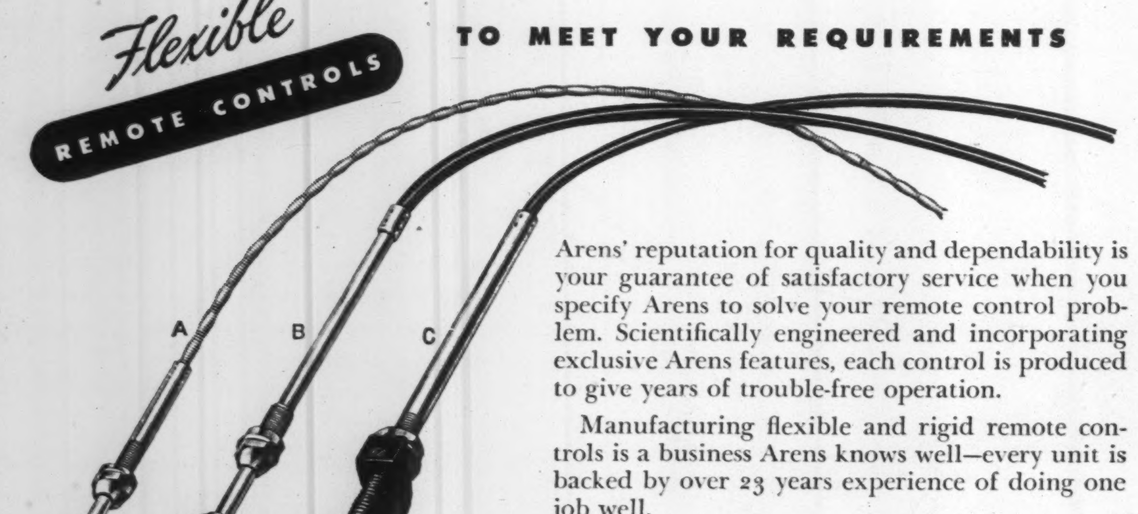
This burner operates on straight natural gas and mixed gas to 800 B.t.u. Gives perfect horizontal distribution. Write for Bulletin No. F600H.

THE WEBSTER ENGINEERING CO.

TULSA —DIVISION OF— **OKLAHOMA**

Surface Combustion . . . . Toledo, Ohio

Flexible REMOTE CONTROLS TO MEET YOUR REQUIREMENTS



Arens' reputation for quality and dependability is your guarantee of satisfactory service when you specify Arens to solve your remote control problem. Scientifically engineered and incorporating exclusive Arens features, each control is produced to give years of trouble-free operation.

Manufacturing flexible and rigid remote controls is a business Arens knows well—every unit is backed by over 23 years experience of doing one job well.

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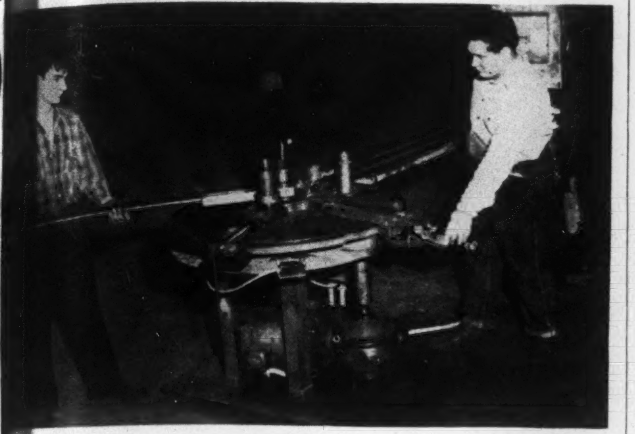
Control Heads (A) shows locking type head which permits rapid push-pull adjustment and permanent locking by spring actuating button control. (B) one of many styles of standard rapid push-pull control heads. (C) Vernier control head permits rapid push-pull adjustment or rotating micro-fine adjustment in the same control.

ARENS CONTROLS, INC.

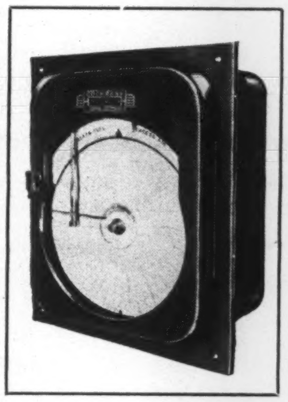
2267 South Halsted Street, Chicago, Illinois

IT'S UNDER PERFECT CONTROL IF IT'S ARENS



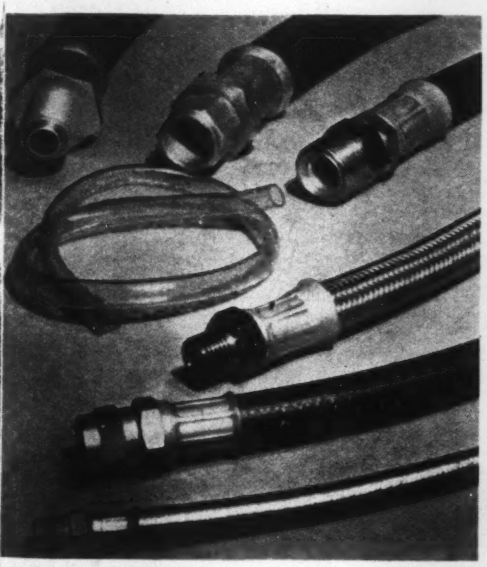
only ¼ in. from the beginning of the bend. In addition, free space between the edges of the fins of adjoining was only ¼ in. And, to further complicate the ma- design, the shape, size and position of the fins was that a circular die resting against the bent portion the tube would interfere with the first three rows of so had to be segmental and collapsible.—Pedrick Tool Machine Co., 3640 N. Lawrence St., Philadelphia 40, Pa.

iler Meter



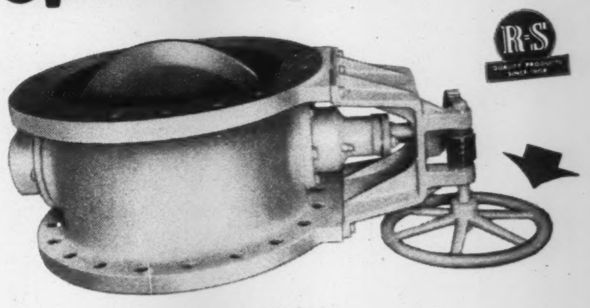
No. 2604—A new boiler meter the steam flow-air-type, known boiler ratio meter, has been ounced. An easily adjustable in the air flow mechanism les the operator to establish relation of air supply and fuel ly as measured by the steam rated. Quick and easy read- s provided by a red indicat- pointer operating across a 10 in. scale. The steam flow anism is the same as for the facturer's standard friction electric flow meter operat- n the null balance principle the air flow mechanism is on the "Hays" slack dia- gm equipped with an electric motor followup.—rane Corp., 3131 N. 17th St., Philadelphia 32, Pa.

matic-Proof Hose Assemblies



. 2605 — ecial line se assem- immune he action fuels of aromatic ent has en de- ed. The e itself tains a made of cially pounded ar, a rub- ke vinyl ic. These e assem- are used fuel, oil, stru- nt and draulic in refrigeration equipment, aircraft, gasoline and l powered trucks, hydraulically operated machine tools, —Resistoflex Corp., Belleville, N. J.

4 to 6 Hand Wheel Turns Open or Close Valve



No. 502—125-pound American Standard. Ball bearing mounted with stuffing box.

The quick operation of R-S Butterfly Valves is readily apparent. This is an important feature in any application but it is especially important where a battery of synchronous-driven pumps discharges into a common header. Burned-out motors at start-ups can be practically eliminated when R-S Butterfly Valves are installed, since it requires only a few seconds of an operator's time to shut off the discharge valves until the pump has gained the desired speed. The valves are then opened gradually, of course.

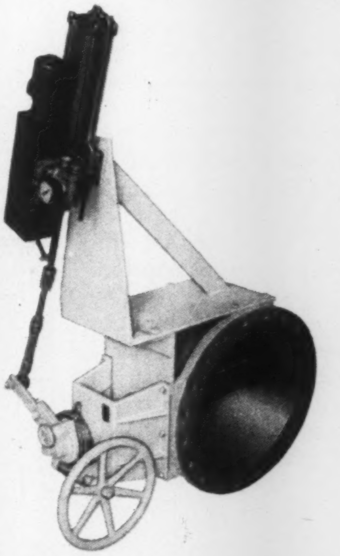
Equipped with hand wheel or chain wheel control, the standard 125-pound valves not only fulfill all requirements to better advantage, but cost less to purchase and install than conventional type valves.

NO SLAM—NO LINE DAMAGE

The 125-pound valve, equipped with hydraulic cylinder for power operation, prevents a synchronous-driven pump from grabbing all the load when the pump is started, prevents reverse flow and eliminates water hammer since the valve cannot move any faster than the bleeding of the cylinder discharge permits.

Straight-through flow—control and shut-off for any material that flows or is forced through a pipe.

Constructed in sizes to 84-inches and for **15 to 900 psi.** Write for Catalog No. 14-B.



No. 501—20-inch, 125-pound American Standard. Declutching unit (patent applied for) permits operation with either hand wheel or hydraulic cylinder.

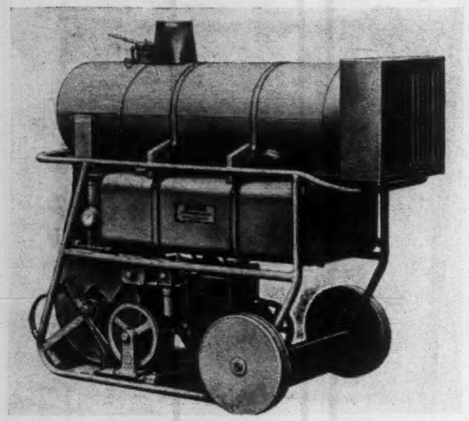
VALVE DIVISION

R-S PRODUCTS CORPORATION

132 Berkley Street • Philadelphia 44, Pa.

RS Streamlined BUTTERFLY VALVES

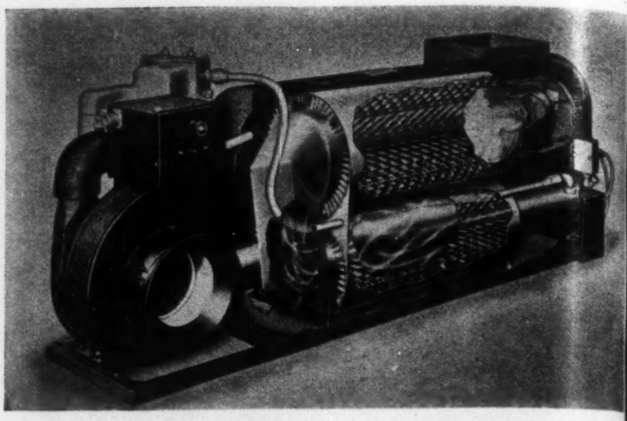
Portable Multi-Service Heater



No. 2606—A new "Janitrol" portable heater which is finding many war plant and military uses is illustrated. It embodies the same "whirl flame" combustion principle as the manufacturer's aircraft heater which permits instant lighting in subzero temperatures and according to the manufacturer, makes it impossible for the heater to blow out regardless of temperature, altitude, or air density. The flame is made to whirl by tangential introduction of air into the combustion chamber. This heater uses liquid fuel and will operate on any grade of gasoline; kerosene also may be used, and with minor modifications the unit will operate on other liquid fuels. Equipped with gasoline engine or electric motor drive and mounted on a two-wheeled carriage, the unit can be moved in wheelbarrow fashion or pulled like a sled. No draft is required for exhausting the products of combustion. Output rating is 250,000 Btu per hr.—Surface Combustion, 2374 Dorr St., Toledo, Ohio.

Aircraft Heater

No. 2607—A new aircraft heater of the combustion type burning gasoline from the plane's tanks combines the multiple functions of cabin heating in flight and on the ground with the transfer from one phase to the other automatically controlled. Also it defrosts the windshields and windows and preheats engines for quicker take-offs in low temperatures. In flight the heater has an hourly output of 90,000 Btu and is said to be quiet in operation.—Anchor Post Fence Co., Baltimore 24, Md.



Rust Dissolver

No. 2608—"Manganesed-Phospholene No. 7" is a new rust dissolver which, according to the manufacturer, dissolves rust and combines chemically with metal surfaces to form an inhibiting coating which resists further corrosion. It is brushed or sprayed on metal after oil, grease, or other foreign matter is removed. Among the applications are water piping, radiators, ventilators, instruments, tools, and structural steel.—Western Reserve Laboratories, 75 Climax Bldg., Cleveland 13, Ohio.

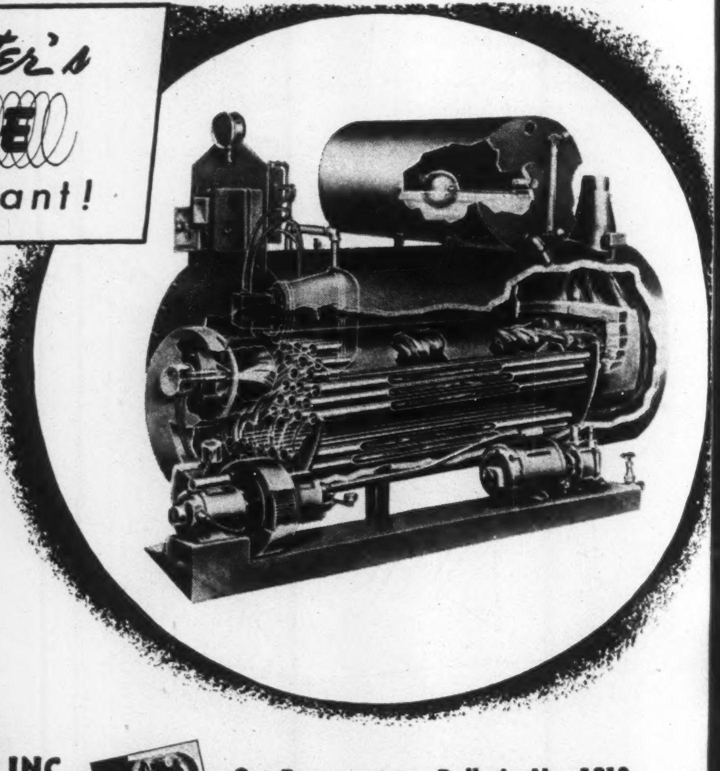
Ceramic Tile Space Heater

No. 2609—A ceramic tile space heater was developed by the housing authority of the city of Pittsburgh in coopera-

The O & S Powermaster's

SPINNING FLAME

Saves Fuel in Your Plant!



You would discover an amazing thing if you glanced through the peep-sight of an O & S *POWERMASTER UNIT!* You'd see a rotary flame that helps you get quick steaming capacity and high thermal efficiency as well as thrifty fuel consumption. A unique oil burner—specially designed by O & S engineers—gives this fast-spinning motion to the flame. So flame "hugs" the combustion chamber's walls—assuring longer gas travel and greater heat transmission. Clean, safe, compact—the Powermaster offers many other advantages in producing steam for power, processing and heating.

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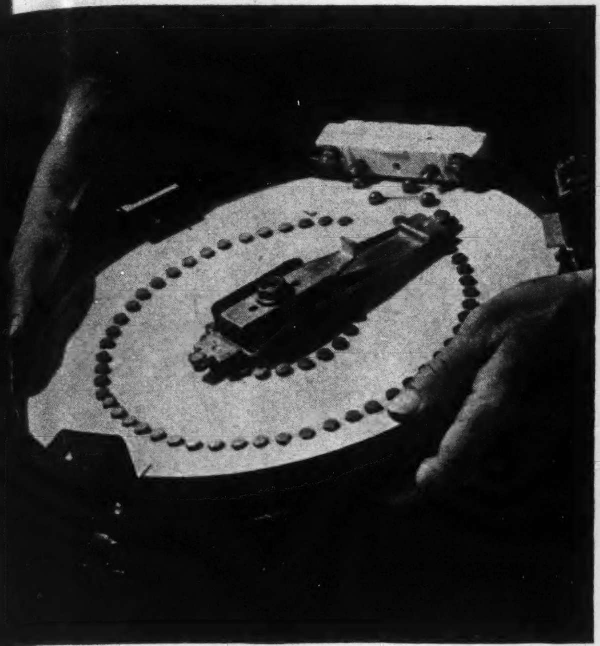

T'S SUBSTANTIAL

A Rheostat is a piece of equipment where substance and quality spell real economy. A good Rheostat properly installed and used will outlast the machine it controls. It is wise, therefore to use the best Rheostat obtainable.

Ward Leonard Pressed Steel Rheostats are built on that premise. They are absolutely smooth in operation due to proper design and fine machining. They dissipate heat from both sides keeping temperatures low. Contacts are round or rectangular solid metal ground for perfect fit. These are but a few of their many advantages.

Bulletin 60 gives full particulars. Send for a copy.

ARMY E NAVY

RHEOSTATS

Pressed Steel Rheostats are made in 4" to 18", Ring types from 1½" to 4", incl.

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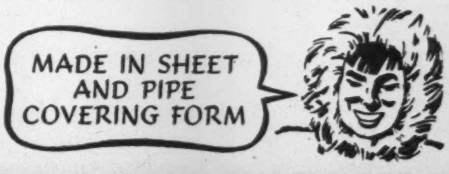
EXTENSIVE laboratory tests, as well as years of actual service have proved that Johns-Manville Rock Cork will not support the growth of bacteria or mold. All materials used in its manufacture are odorless. It is immune to vermin and termites.

Besides being unusually sanitary, J-M Rock Cork has these other big advantages that make it the preferred low-temperature insulation:

LOW THERMAL CONDUCTIVITY
RESISTANT TO MOISTURE
DOES NOT EMBRITTLE
SHRINKS LESS THAN STEEL
TIGHT JOINTS
STRUCTURALLY STRONG
EASY TO SAW AND APPLY

For the full story on J-M Rock Cork, write for brochure, DS-555, Johns-Manville, 22 East 40th Street, New York 16, N. Y.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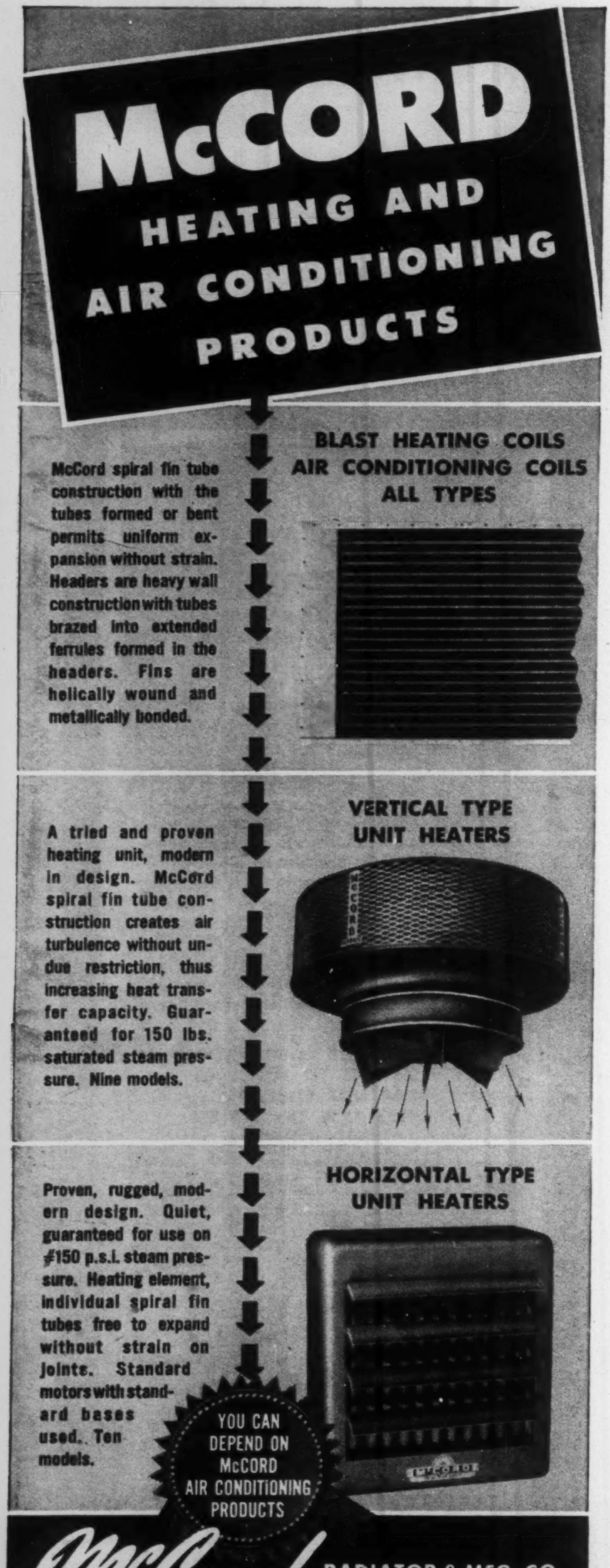
ROCK CORK



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BLAST HEATING COILS AIR CONDITIONING COILS ALL TYPES

McCord spiral fin tube construction with the tubes formed or bent permits uniform expansion without strain. Headers are heavy wall construction with tubes brazed into extended ferrules formed in the headers. Fins are helically wound and metallically bonded.

VERTICAL TYPE UNIT HEATERS

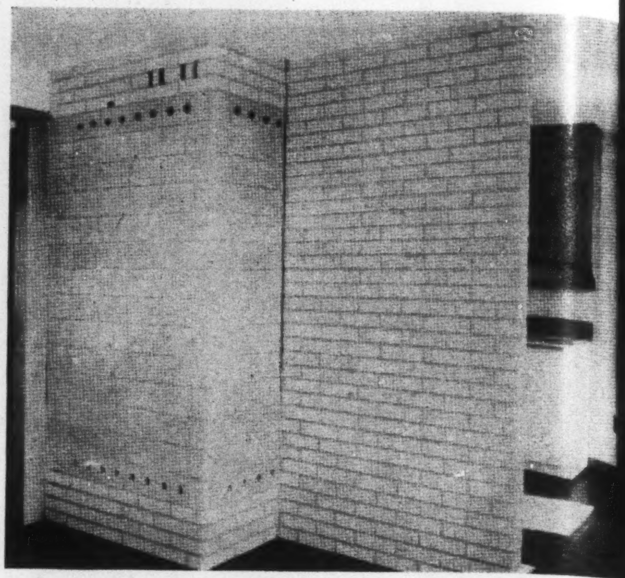
A tried and proven heating unit, modern in design. McCord spiral fin tube construction creates air turbulence without undue restriction, thus increasing heat transfer capacity. Guaranteed for 150 lbs. saturated steam pressure. Nine models.

HORIZONTAL TYPE UNIT HEATERS

Proven, rugged, modern design. Quiet, guaranteed for use on #150 p.s.i. steam pressure. Heating element, individual spiral fin tubes free to expand without strain on joints. Standard motors with standard bases used. Ten models.

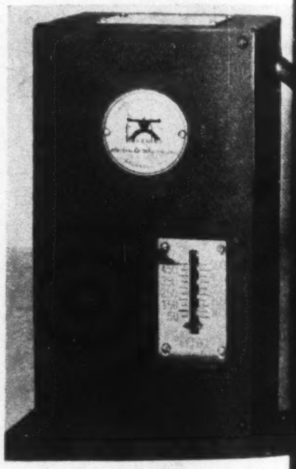
YOU CAN DEPEND ON McCORD AIR CONDITIONING PRODUCTS

McCord RADIATOR & MFG. CO.
DETROIT 11, MICH.



tion with the Federal Public Housing Authority for th Broadhead Manor war housing project. It consists of brick and tile chimney with a grate and firebox at th bottom, the chimney being designed to pass through both stories of a two-story house in an interior location in orde that its surfaces are exposed in the principal rooms of th house. A series of fire clay baffles is used at interval above the firebox. The heat liberated by the combustion of fuel on the grate warms the chimney, from the surface of which heat is emitted by radiation and convection t the rooms. At the project the heater has been constructed in 296 two-story, row house dwelling units and in 20 one story, quatrafoil type dwelling units.—Housing Authority of the City of Pittsburgh, Technical Division, 417 Gran St., Pittsburgh 19, Pa.

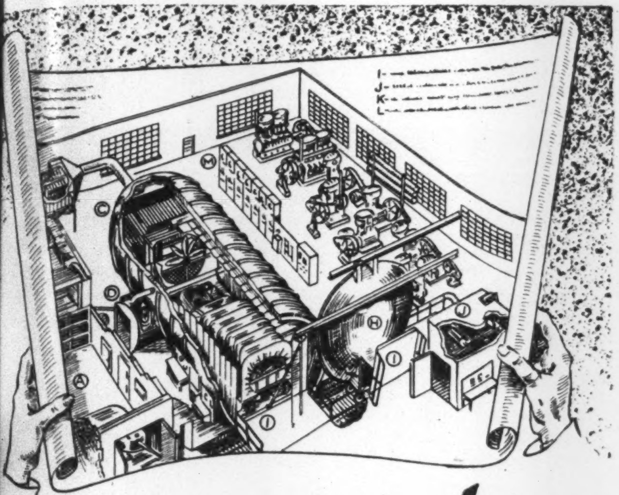
Electrical Pressure Switch



No. 2610—A new type of electrical pressure switch with pressure ranges from 5 to 5000 lb is equipped with a direct action gage for hydraulic pressures operating a sensitive electrical switch. Overall dimensions of the unit illustrated are approximately 10 x 7 x 3 in. Applications include solenoid operated valves, automatic control of operating cycles on hydraulic machines, control of pumps or compressors, and for operating and safety controls in the chemical and oil industries.—Hercules Electric & Mfg. Co., Inc., 2416 Atlantic Ave., Brooklyn 33, N. Y.

Stoker Timer Relay

No. 2611—A new primary stoker control, the "Thermo-Pilot," utilizes the principle of thermal action. Tested i actual installations for four heating systems it is now available for general use. Electric current supplies hea energy to the bimetal element and when sufficient heat ha been stored in the element a circuit is closed which energizes the stoker relay and places the stoker in operation As the bimetal is cooled, the relay is de-energized, th stoker stops, and the cycle is repeated. This hold-fir operation can be adjusted for short, medium, or long operating periods.—Perfex Corp., 500 W. Oklahoma Ave., Milwaukee 7, Wis.



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Inside Data on

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As used in the great All-weather Laboratory of the Corps of Engineers, U. S. Army.

Get your complimentary copy now of this diagram (it's twice letter size, and is complete with description and photographs) showing one of the most remarkable air conditioning and refrigeration plants ever built. Job includes ten ammonia compressors, in 3-stage hook-up, with automatic controls for maintaining temperatures between 70 deg. below zero F. and 150 deg. above, in three chambers —one a 22 ft. dia. tunnel, 48 ft. long, arranged for stratosphere conditions! Write now to

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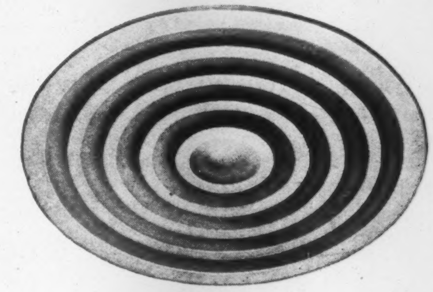
AEROFUSE OUTLET

•1•

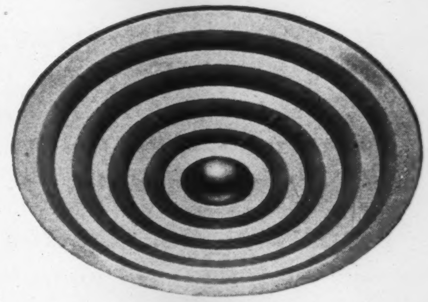
MAXIMUM AIR MIXTURE



TYPE S1

•2•

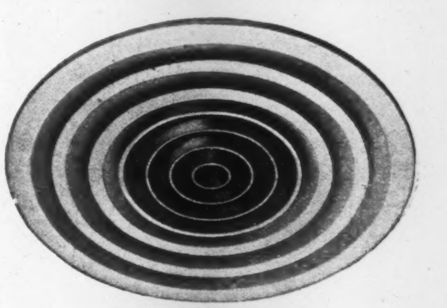
RAPID TEMPERATURE EQUALIZATION



TYPE E

•3•

PERFECT AIR DISTRIBUTION



TYPE R1

•4•

TOTAL ELIMINATION OF DRAFTS

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TUTTLE & BAILEY, INC.
NEW BRITAIN, CONN.

PETRO
REG. U.S. PAT. OFF

OIL BURNING SYSTEMS

Petro Class A (Industrial) Equipment is currently available under W.P.B. regulations and ratings.

Petro equipment includes:

DOMESTIC "CONVERSION" BURNERS
1 to 6 gal. per hour

LARGER "LIGHT (No. 3) OIL" BURNERS
general application type
6 to 18 gal. oil per hour

COMBINATION BURNER-GENERATOR UNITS
both steel and C. I. sectional boilers; forced warm air units; and instantaneous water heaters.

INDUSTRIAL OIL BURNERS
Manual - Semi Auto - and Automatic* for either un-heated or pre-heated industrial oils, up to 145 g.p.h. Built-in motor or belt drive.

When pre-heated oils are burned the Petro Thermal Viscosity system insures consistent maximum combustion efficiency at all firing stages, automatically and reliably.

Petro Engineering co-operation is still available. Research-development is active. When your post-war activities start, Petro will be ready for you.

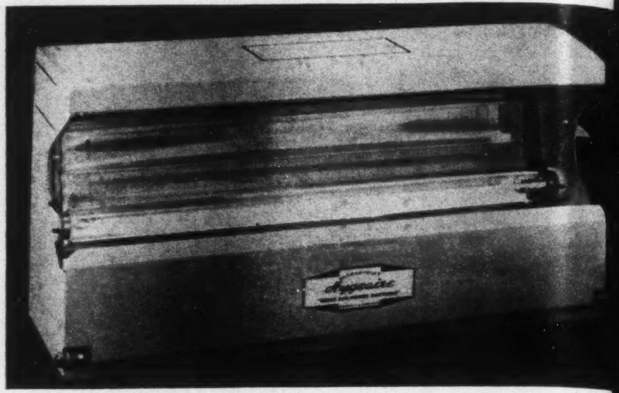
OIL IS AMMUNITION
USE IT WISELY

Full data on Petro Industrial Burners are in our Catalog—see Sweet's or Domestic Engineering Catalog Files—or we will gladly send copies on request.

PETROLEUM HEAT AND POWER COMPANY
Makers of Good Oil Burning Equipment Since 1903
STAMFORD CONNECTICUT

Germicidal Radiation

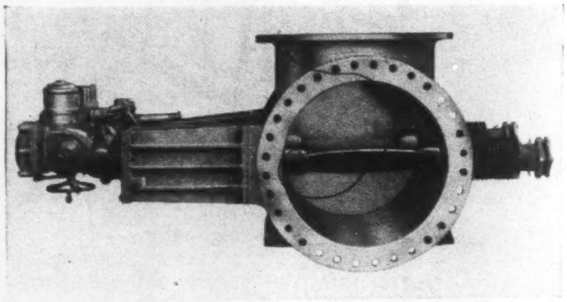
No. 2612—Germicidal effects of ultraviolet rays are ap-plied to the disinfection of air in a new device known a the "Hygeaire" system. It is a combination of a "G-E"



germicidal tube and a patented reflector designed to projec a zone of protection across an area above eye level. Ac-cording to the manufacturer, airborne bacteria and viruses are carried into the zone of ultraviolet rays by air currents "giving to the protected space the germicidal effect of 10 air changes per hour."—American Sterilizer Co., Erie, Pa

Three Way Valve

No. 2613—The simplified design and quick action of the butterfly valve have been applied to a three way valve designed for quick interchange and mixing service and



for all pressures from 15 to 900 psi, says the manufacturer. It is adapted to manual control as well as power operation and elevated temperatures. Dual finned lubricating stuffing boxes are provided for high temperatures and pressures.—R-S Products Corp., Germantown Ave. at Wayne Junction, Philadelphia 44, Pa.

Details of Next Season's Fuel Oil Rationing Program

Simple re-application forms for next season's fuel oil rations will be mailed out to all consumers beginning early in June, Administrator Chester Bowles of the Office of Price Administration said last month, in announcing the details of next season's fuel oil rationing program.

"We are making a special plea for consumers to return these filled-in forms to their local war price and rationing boards within seven days after they receive them," Mr. Bowles said. "If these forms are sent back within a few days, boards will be able to begin handling them immediately and thus can start issuing ration coupons by July 1. Early issuance will relieve storage facilities and permit consumers to fill up their tanks during the summer and early fall months when dealers' trucks and other means of transpor-tation are not so busy."

The 1944-1945 program—the third year of fuel oil ration-ing—will continue essential features of the program suc-

Use Swartwout *AIRMOVER* for Efficient Industrial Ventilation

Custom built to the roof—gives positive results

Nothing can surpass Nature's principle of positive air movement in clarifying building atmospheres. Heat and smoke move *upward*—all you have to do is provide proper *efficient* roof opening with positive weather protection to secure better ventilation results.

Swartwout AIRMOVER harnesses Nature's forces, speeds heat, smoke and fumes through factory roofs. With its special design, *all* of Nature's principles are made to help the important air-moving job with greater efficiency than can be obtained by mechanical means.

It's like opening your roofs to the sky . . . yet with full protection from the elements. Swartwout air movement engineering points the way to better air-working conditions—now recognized as important as lighting, safety and other factors which influence production. Ask us to show you how. THE SWARTWOUT COMPANY, 18511 Euclid Ave., Cleveland, O.

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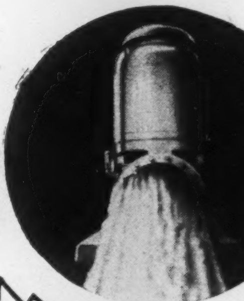

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The realization of dependable uninterrupted pumping service year after year

10 TO 220,000 G.P.M.

Peerless Pumps

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PEERLESS PUMP DIVISION, *Food Machinery Corporation*
301 W. Ave. 26, Los Angeles 31, California
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OTHER FACTORIES: San Jose 5, and Fresno 16, California

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Research Air Filters are most efficient for catching dust, dirt, lint, soot and pollen from the air. Exclusive Rip-Clean feature multiplies life.

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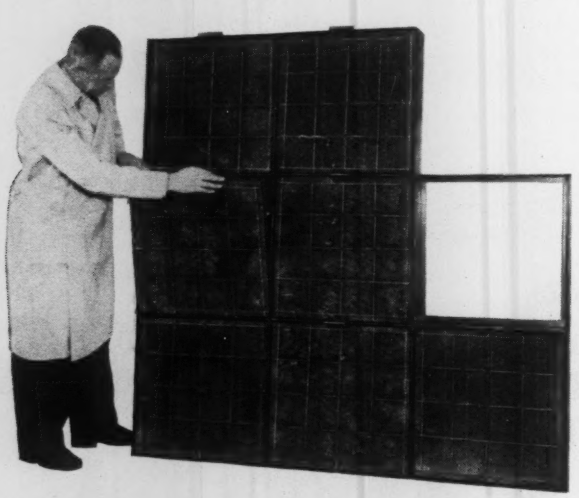
- Central Air Conditioning
- Ventilating Systems
- Railroads
- Forced Warm Air Furnaces
- Unit Air Conditioners
- Paint Spray Booths
- Air Intakes on Diesels and Air Compressors



Behind every foot of frontal area in the Research Air Filter are over 25 square feet of deposit surface which give a high dust holding capacity.

RESEARCH PRODUCTS CORP.
Madison 3, Wisconsin

cessfully in operation during the last winter. It is based on the information OPA has received that just about as much, but no more, oil is expected to be available for civilian use. Following are some of the major features of next season's program:

1—Heating and hot water rations will generally be the same as those issued for the 1943-1944 season except that all oil and kerosene heating stove rations will be reviewed. If not done previously, a decrease in the ration for these oil stoves which is based on a maximum floor area of 550 sq ft per stove, will be made.

2—The new application form (form 1167 revised) will ask several additional questions this season to enable boards to issue rations based on up-to-date circumstances. The following questions have been added:

a) Number of children under 6 years of age (raised from under 4 years).

b) Type of heating equipment; i.e., central heating plant, or oil heating stove, for example. This question will enable boards which have not already done so to review oil and kerosene heating stove rations carefully.

c) Equipment used to heat water, number of persons living in the house, and number of months hot water is heated. These questions will enable boards to issue equitable hot water rations based on current circumstances.

3—The new ration coupon sheet will be similar to last year's in size, shape, and general design. The class 5A sheet (replacing the old class 5 and issued for heating moderate sized homes) will contain coupons worth 2600 instead of 2000 gal.

4—The same amount of their ration as last year—approximately one-third of the total ration—will be made available to consumers beginning July 1, to allow for summer fill-up. This amount will be made up of the definite value "consumer reserve" and "change-maker" coupons and the indefinite value "period 1" coupons. The remaining part of the ration, the rest of the indefinite value "period" coupons, will become valid at specified dates during the winter.

Next season's revised stub, attached to each coupon sheet, will explain more clearly the meaning of the "unit" coupons and will contain other information to help consumer budgeting. The fact that a 5 unit coupon is worth 50 gal of fuel oil at par, and a 25 unit coupon is good for 250 gal will be noted clearly on each stub to avoid any misunderstanding.

In addition, local boards will write in on the coupon stub the total gallonage value of the coupon sheet, which will correspond to the consumer's total ration in all cases except where a consumer is issued more than one coupon sheet. During the past year only the number and type of the coupons was written on the stub. This required the consumer to calculate the gallonage value of his ration.

"In working out the new fuel oil program we have accepted, for the most part, the recommendations made by the petroleum industry and our organization in the field," Mr. Bowles said. "Both of these groups recommended that changes be held to a minimum and be confined to those which would result in definite simplification and improvement in the program.

"The changes announced are in line with these suggestions. We are continuing the 1944-1945 program substantially as it was this past year. The few changes we are making will, I am sure, make for a smoother working oil rationing program both for the industry and the general oil user."

Fuel oil rationing will again apply to the 30 east coast and midwest states and to Washington, Oregon, and part of Idaho, where fuel oil has been rationed during the last two years. There is no intention to extend rationing to any of the states not now under rationing, Mr. Bowles said. "On the other hand," he said, "the Petroleum Administration for War has told us that at the present time they see no evidence that the supply of heating oils for civilian use, particularly kerosene and distillate (light) oil, will be any larger than this past heating year.

"During most of the last two years it was necessary to ration fuel oil mainly because of a shortage of transportation facilities. This problem has been greatly relieved. In addition, fuel oil production is now at an all time high. Yet we must continue to ration because, despite increased production, military, and essential industrial demands have also risen to an alltime high. As a result, oil for civilians is still very short.

"On the basis of the information we have been given by PAW, our rationing program for 1944-1945 must be planned on the assumption that we will have no more oil available than this year, and that there may be less kerosene. Should larger supplies later prove to be available, rations will be increased by raising the unit value of consumers' coupons."

Next season, all coupons are to remain valid until the end of the heating year, August 31, 1945, rather than expiring at specified dates during the winter as was the case with the period coupons the past season. The validity dates of the period coupons has been changed in order to ease delivery loads and at the same time encourage consumer budgeting. Periods 1 and 5 will be lengthened and the other three periods will be correspondingly shortened.

The new heating year will start on September 1. Provision will be made for consumers during the month of September to exchange any currently valid coupons they may still have after September 1, so as not to penalize those who conserved during this season.

Some of the basic features of the present year's program which OPA expects to continue without change next winter are:

1—The heating year will again be divided into five heating periods. In the midwest and south, periods 2 and 3 will again be combined and also periods 4 and 5. Should the supply situation permit it, periods 4 and 5 in the east will also be combined.

2—The present 10 zones within the 33 state rationed area will be kept during 1944-1945.

3—Rations for R-1101 consumers will remain unchanged. These consumers include all persons, other than those occupying private dwellings, who use fuel oil for heat and hot water. R-1101 rations are issued to residential consumers, such as apartment houses, and non-residential consumers, such as office buildings.

4—Industrial, commercial, and governmental consumers using fuel oil for processing, and not for heat or hot water, will continue to receive the oil rations they need on a quarterly or semi-annual basis. They will not be asked to fill out the heating renewal form required of other consumers.

BUY WAR BONDS

The Engineering Profession

The famous address before the Engineering Institute of Canada in 1941 by William E. Wickenden, president of Case School of Applied Science, entitled The Second Mile, has been reissued by the Engineers' Council for Professional Development, 29 W. 39th St., New York 18, N. Y., under the title, The Second Mile—A Re-survey, 1944.

ECPD editions of the original address were distributed to the extent of approximately 21,000 copies. So popular was the address that the ECPD persuaded President Wickenden to revise it somewhat with the particular object of presenting the engineering profession to the young engineer. The text was shortened, the style modified to make it more appropriate and appealing, and a section, Does an Engineer Need His Profession?, was added.

This new material is very pertinent to all engineers in the present confusion as to professional status, when it is even being asked "Will postwar engineering be labor or a profession?"

Copies of the new edition may be obtained from the ECPD. The price is $3 per hundred; 5 cents a copy in small lots; and 10 cents for single copies.

our HEART'S still in
the fight!
QUIET
MAY
OIL BURNERS
MAY OIL BURNER CORP.
BALTIMORE-3, MD.

Planning for Postwar Jobs

Providing jobs for 12,000,000 victorious returning war veterans is a responsibility that will have to be assumed by leaders in industry, W. S. Shipley, chairman of the board and director of the York Corp. declared in an address last month before the municipal postwar planning committee for the central Pennsylvania region. "And from my observations," Mr. Shipley added, "I feel that industrial leaders are assuming this responsibility."

In opening his address, Mr. Shipley expressed his belief that millions of Americans now feel that this country not only must win the war, but must also win the peace. Unfortunately, he said, there are far too many people among us who still think that we had better win the war first, and then start talking and planning to win the peace. He pointed out that such planning takes a great deal of time, and that beginning now would be none too soon.

He predicted that the postwar world will be different from the prewar world in that it is impossible to take 12,000,000 young men and women out of civil life, train them for war, and expect them to come back and live the same kind of life they led before they went away. "These men and women will come back after winning the victory, which we are sure will be ours, with a different outlook on life. They will feel they earned the right to make certain demands and will expect these demands to be granted. I think their foremost demand will be that they be given a job."

In support of his contention that industrial leaders have recognized their responsibility in regard to creating jobs and are doing something about it, Mr. Shipley cited the fact that for more than a year a group of leading industrialists, organized into the Committee for Economic Development, has been devoting time and money to postwar planning with, he said, the sole purpose of creating jobs.

Mr. Shipley then described the committee by saying that its one objective is to give jobs in private industry. It expects to accomplish this, he said, by establishing in every community throughout the country local economic development committees to assist local commerce and industry in preparing for the postwar period. The aim is to broaden markets so as to give employment to at least 25 per cent more people than were employed in 1941, he said. The national committee, he reported, has well over 1200 local committees organized at present.

He said that the CED looks forward to employing between 55 and 56 million people in the postwar period.

He then described the procedure being followed in the York county (Pa.) postwar planning program, said that the work was organized along the same lines as the county's successful pre-war planning activities, and that it was sponsored to a large extent by the manufacturers' association and the local chamber of commerce. The county postwar planning committee organization includes subcommittees on economic development, transportation, streets and highways, public utilities, health and sanitation, housing, schools, public recreation, rural development, and a committee on boroughs designed to encourage boroughs to set up their own committees. He reported that just recently the York chamber of commerce and the manufacturers' association jointly agreed to provide, for the time being, the money and manpower necessary for this project.

Mr. Shipley concluded with an outline of how an individual employer can get behind the postwar effort, using the York Corp.'s planning setup as an example. He said that the corporation, under the guidance of Stewart E. Lauer, president, began in October 1942 to organize a postwar advisory committee. This, he said, is a part-time group headed by the vice-president in charge of engineering and manufacturing and includes representatives from seven of the corporation's principal divisions. Under the executive vice-president, a second group is set up composed of managers of the administrative, field sales, home sales, engineering, and manufacturing divisions. A third group reporting directly to the president is assigned the study of production, markets, and marketing. He invited his listeners to call on the corporation for further information at any time.

THE PILOT GIVES YOU POSITIVE CONTROL!

The special "metering pilot" in the K & M *Remotrol* Liquid Level Control gives you instantaneous precision valve action. The slightest rotation of the stuffing box shaft is immediately transmitted to apply or release pressure on the diaphragm motor valve. The slightest change in liquid level thus is automatically corrected. This most accurate of level controls can be furnished with a "V" port, parabolic, or beveled type Inner Valve of bronze, Monel, stainless steel. Special alloys can be furnished on application. For dead end service, a single seated main valve may be had. We invite you to submit your "hard-to-solve" control problems to our Engineering Department.

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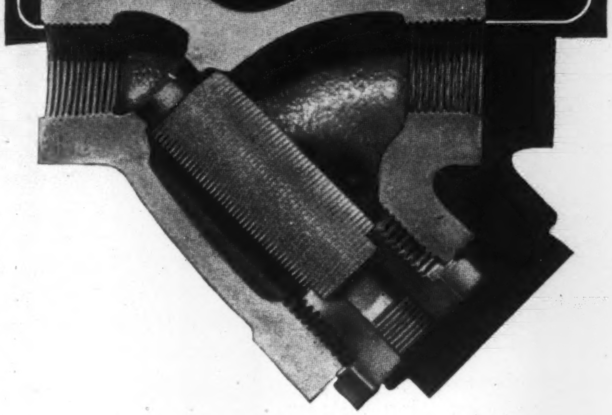
KIELEY & MUELLER, INC.
MANUFACTURERS OF PRESSURE AND LEVEL CONTROLS
NORTH BERGEN, NEW JERSEY

It says "STOP" to Solids— "GO" to Fluids



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- **FIRST**—*The Screen,* a high-grade woven Monel wire basket that catches solids—lets condensate, oil or other fluids flow freely.
- **SECOND**—*Finish.* Cadmium plated inside and out for protection against corrosion.
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- **THOUSANDS IN SERVICE**—Sold by over 100 Mill Supply Houses.

6 sizes from ½" to 2" for pressures up to 600 lb. Reasonably priced. See your supply house or write for Bulletin S-200.

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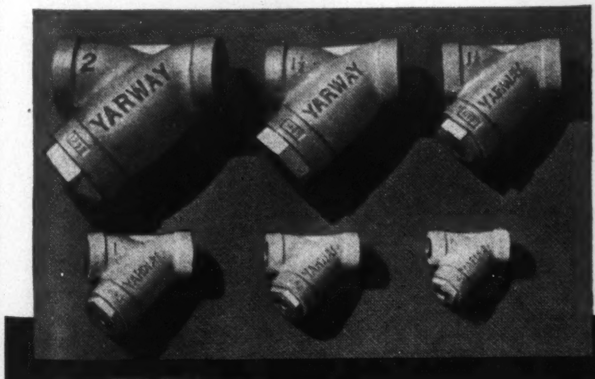

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AIR CONDITIONING

Available for Essential Needs

☑ PRECISION MANUFACTURING
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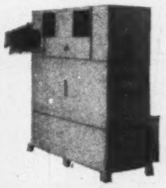
★ The four seasons are as one where STREAMAIRE Air Conditioning Units are installed. Wide variations in outdoor temperatures and humidity are leveled off into a controlled uniformity that assures ideal research, manufacturing, processing and operating conditions.

Tolerances for precision tools and instruments on many government contracts require that they be manufactured under controlled temperatures and humidity. Priorities for equipment to correct excessive heat and contaminated air conditions harmful to the health of workers can also be obtained. Food processing plants (engaged in canning, dehydrating and freezing perishable foodstuffs), biological laboratories and hospitals may also install YOUNG Air Conditioning Equipment.

If you are not eligible for the cooling and dehumidifying features, you can install a STREAMAIRE Unit with the heating coil now and merely add the cooling coil when restrictions are lifted. Write for Catalog No. 7541.



☆ ☆ ☆ *STREAMAIRE Air Conditioning Units are made in eight horizontal and eight vertical models with capacities ranging from 400 to 16,625 cfm. The large unit above is designed for ceiling suspension. The model at the left is a floor unit.*

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Manufacturers of Oil Coolers • Gas, Gasoline, Diesel Engine Cooling Radiators • Intercoolers • Heat Exchangers • Engine Jacket Water Coolers • Unit Heaters • Convectors • Condensers • Evaporators • Air Conditioning Units • Heating Coils • Cooling Coils • and a Line of Aircraft Heat Transfer Equipment.

YOUNG RADIATOR CO., Dept. 114-E, RACINE, WIS.
APPLICATION ENGINEERS in Principal Cities

WPB Restricts "Freon-22" Refrigerant

The War Production Board acted April 21 to sharply restrict deliveries of the refrigerant "Freon-22", particularly for use in any system of comfort air conditioning and any installation for storing or dispensing carbonated or malt beverages.

"F-22" is a comparatively new refrigerant and has, to date, been utilized mainly for low temperature experimenttal work, such as for testing flying clothes and instruments under simulated stratospheric conditions and for the shrinking of metals. The present inventory of "F-22" is deemed insufficient to permit uncontrolled withdrawals, according to WPB.

Expectation that owners of refrigerating and air conditioning systems that have been prohibited from obtaining delivery of "F-12" might attempt to substitute "F-22", heretofore available without control, led to the issuance of this revision of conservation order M-28. With the revision the order is known as M-28-a.

Even with the imposition of these new restrictions on deliveries of "F-22", WPB estimates that inventories of this refrigerant, at the present rate of authorized withdrawals, will drop to a critical low about July 1.

Assurances were given by WPB that with these restrictions in operation, an adequate supply of "F-22" will be available for those systems designed specifically to use this refrigerant for war production purposes.

The types of refrigerating systems and comfort cooling installations which come under the new restrictions, in addition to those operated by civilians, include those operated by the Army, Navy, Maritime Commission or War Shipping Administration, including post exchanges and ships service stores, other than those used aboard ships.

Civilian operated systems which are restricted from the use of "F-22" are identical with those prohibited from using "F-12". They include:

Amusement parks.
Animal hospitals.
Auditoriums.
Ballrooms, dancing studios and dance halls.
Bank and loan associations.
Bars, cocktail lounges, and beer parlors.
Bowling alleys.
Concert halls.
Funeral parlors.
Golf clubs, country clubs, athletic clubs, and all other clubs and club houses.
Hotels and apartment houses.
Moving picture houses.
Night clubs.
Office buildings and offices, public or private.
Railway, streetcar and bus stations and terminals.
Residential buildings and dwellings of all kinds.
Restaurants, cafeterias, and other places selling meats, foods or beverages.
Schools.
Service establishments, such as laundries, cleaners and dyers, tailor shops, barber shops, "beauty" parlors, automobile sales and service shops, and repair shops of all kinds.
Studios of all kinds.
Skating rinks.
Stores, selling any kind of products, material or merchandise, at retail or wholesale (excluding manufacturing establishments).
Theaters.

Sees No Great Change in Products or Distribution

"There is little indication of any great change in many products when production is resumed," said W. A. Reichle, president of the Central Supply Association, in his report at the spring meeting of the association in Chicago on April 27.

With reference to distribution, Mr. Reichle said:

GIVE FLEXIBLE HEAT

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DIRECT-FIRED UNIT HEATERS

WHERE, WHEN, AND HOW YOU NEED IT

For permanent or temporary, for additional or emergency heating. Can easily be moved to other rooms or buildings. Automatic controls prevent heat-wastage. Direct heat outlets save fuel. Powerful blower spreads heat evenly without draft. May we give you detailed information on this flexible and economic way of heating?

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Piping units for ships, fabricated by the thousands from copper tubing and fittings with Sil-Fos inserts.

–the modern way to construct non-ferrous PIPING

IDE-SCALE USE in the war's vast construction programs has estab-hed SIL-FOS brazing as the fast, reliable, low-cost way to connect non-ferrous piping.

has proved that SIL-FOS brazing by eliminating pipe threading has eatly simplified assembly and speeded up this work surprisingly.

has confirmed the fact that this low-temperature silver brazing oy makes leak-tight joints that equal or exceed the metals joined strength and ability to withstand severe vibration, shocks and tremes of temperature.

has shown that the cost of non-ferrous piping construction by the L-FOS brazing method is surprisingly low.

you are in any way concerned with the installation of non-ferrous ping, check up on this modern way to install piping. BULLETIN -A will give you full SIL-FOS details. Write for your copy today.

ttings and flanges with l-Fos inserts greatly plify—and speed up ing construction. Just an, flux, slip fitting er pipe and heat. This -away T-fitting shows ert and two finished nts. Note complete-ss of Sil-Fos penetra-n.

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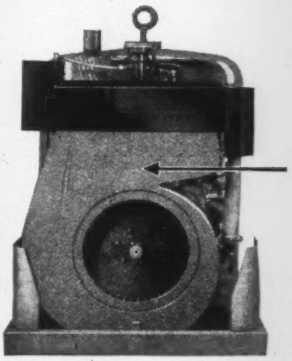
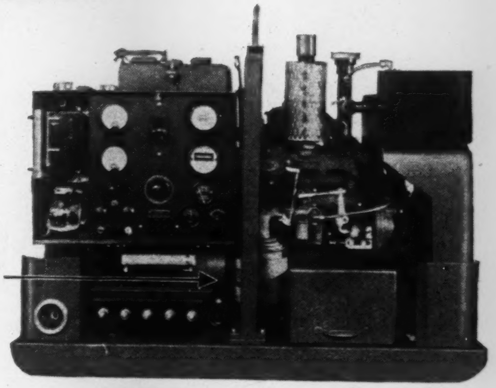
LAU BLOWERS specified in the new HOBART 5KW POWER PLANT

A complete generator in one package, the Hobart 5 KW Power Plant was designed for minimum space and weight—to be air-borne—to function in all climates, under all conditions. Integral accessories include two sirocco blowers by Lau—one for cooling the generator, and another one for cooling the top-mounted radiator.

If you now manufacture, or plan in the future to design and manufacture commercial or industrial refrigerating, air conditioning, heating, power, or other equipment requiring blowers, blower wheels, propeller fans, or similar units of equipment, get in touch with Lau. Whether stock or special sizes may be applicable, Lau engineers will be glad to figure with you without obligation. Lau equipment is obtainable now on properly rated orders. Write us.



LAU BLOWER FOR COOLING RADIATOR



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WORLD'S LARGEST MANUFACTURERS OF FURNACE BLOWERS

Engineers and fabricators of general Air Handling Equipment
Single Inlet and Double Inlet Blowers • Propeller Fans • Accessories

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BI-MIX BURNER
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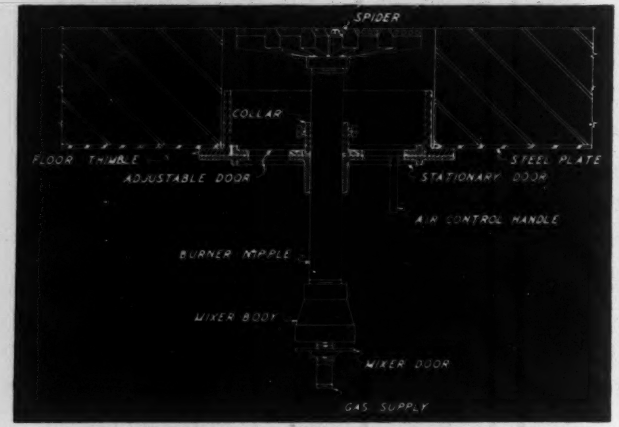
FLOOR FIRING



JOHN ZINK VBM — Gas Type

The John Zink VBM — Gas Type Burner fires a furnace to a higher rating — more evenly — than any other way possible.

It burns with an extremely short flame. Performs well with extremely low draft.

Its special construction makes for better distribution of air for combustion.

In large sizes the VBM can be used for access door — for inspection of furnace.

Sizes: 14", 16", 18", and 20" diameters.

The John Zink Oil Burners MTH or MTB are inserted through center of the spider, to make the John Zink VBM — Combination Type Burner.

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"I do not believe that the active, progressive distributor, nor the wide-awake modern contractor need worry about the basic method of distribution as we have known it. However, we as wholesalers will have to reach a high point of efficiency in our business. A wholesaler will have to be a genuine stocking jobber and not take on the appearance of a broker for many lines.

"The basic fact is that the cost of distribution must be reduced. The reduction must be borne by the manufacturer, by the wholesaler, and to some degree, by the contractor. Duplication of effort and service must be eliminated."

Sufficient Building Supplies Three Months After War Ends

Sufficient supplies of most building materials and equipment will become available to permit large scale resumption of residential and other civilian construction within three months after the end of the war with Germany, Russell G. Creviston, general postwar chairman of the Producers' Council, stated at a meeting of the organization's board of directors, early this month.

"The production of most building materials has continued in large volume throughout the emergency to fill the requirements of the huge war construction program, with the result that relatively little reconversion is required to meet civilian construction needs after the war", he said. "Consequently, materials manufacturers can resume the filling of nonwar orders as soon as the war production program is cut back. It is anticipated that lumber will remain longest on the critical list, in view of the heavy requirements for crating of war supplies, but the end of the war with Germany should make it possible to release fairly large quantities of lumber for use in urgent civilian construction.

"The situation is somewhat different in the case of fabricated building products, inasmuch as many manufacturers have been producing goods other than their normal civilian lines during the emergency. With the exception of heat-

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PRESSURE ACTUATED
CONDENSING
WATER REGULATORS

Individually tested for efficient operation—these valves will give dependable, trouble-free performance. Diaphragm operated — For Ammonia, Methyl or Freon. Type WM incorporates a high pressure safety cut-out. Both types available in sizes ranging from 3/8" FPT to 2" FPT.

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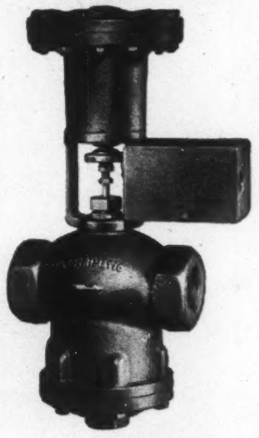

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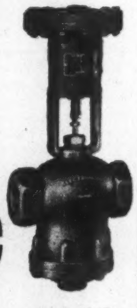

TYPE WR

Electrimatic
2100 INDIANA AVENUE
Chicago 16, Illinois

ing, plumbing, and electrical equipment, however, most companies report that they will be producing large quantities of products required for civilian building within three months after reconversion begins.

"A recent survey of the current production of building product manufacturers in the council indicates that only 15 per cent have discontinued their normal lines entirely, in favor of war goods. Over 26 per cent have continued to make pre-war products exclusively in order to meet the demands of the war construction program and of essential maintenance, and 85 per cent of the manufacturers have continued production of pre-war lines along with other products being made exclusively for war use.

"Thus, while 75 per cent of all building product manufacturers are engaged in the production of distinctly new products needed in the war, all but 15 per cent also have continued to turn out the same products that will be required in the civilian construction program as soon as restrictions are removed."

He stated that complete information is not yet available with respect to the number and nature of new building products to be available for early postwar use. "Many manufacturers have indicated that their distinctly new postwar products will not be generally available until quite some time after the end of the war," he said, "owing to the fact that there has not been sufficient time to perfect and test many of the new developments and because considerable time will be needed to tool up for the new lines."

He said that "throughout the industry, the intention is to produce thoroughly reliable and tested products as quickly as possible and in the largest possible quantities, so as to permit an early resumption of postwar construction. However, some decidedly new lines, developed and tested during the war construction program, will be ready for the market as soon as restrictions are lifted. In addition, there will be many other building products offered for early use that represent distinct improvements on pre-war models."

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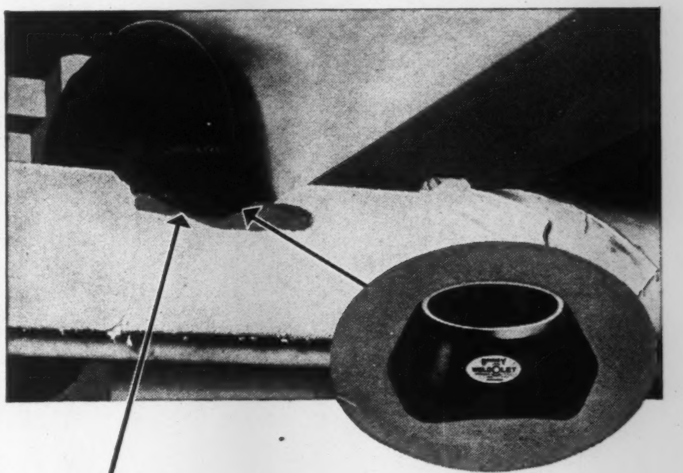

Fittings for the WeldOlet method are available in three types—WeldOlets (illustrated above) with welding outlet, ThredOlets with threaded outlet and Socket-End WeldOlets. Stock fittings are drop forged steel. Also available in Monel, Everdur, Toncan Iron, wrought iron, etc.

How to make branch pipe outlets without cutting the main pipe

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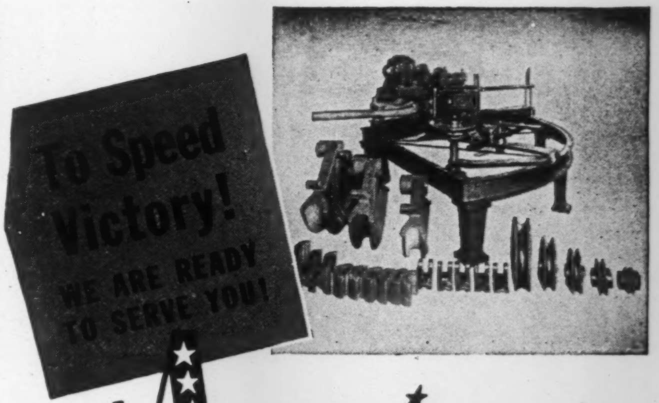
Marine Pipefitting

Marine Pipefitting, by Vern E. Hase, quartermaster pipefitter, and Ralph W. Allen, leadingman pipefitter, both of the Puget Sound navy yard, gives a discussion of steam, water, oil, drainage, gasoline, and other piping systems aboard ship, and has chapters on silver brazing, shop work, lead working, mechanical drawing, plan reading and detailing, applied geometry and flange layout, mitering, piping and branch layout, mathematics, trigonometry, mathematical mitering layout, and mathematical piping layout. There are also chapters on tools, valves and piping material, compartmentation and nomenclature, general shipwork, etc. An appendix over 60 pages in length includes numerous tables and engineering data. This book is published by McGraw-Hill Book Co., 330 W. 42nd St., New York, N. Y., has over 325 pages, and costs $3.00.

Physics of Metals

Surely there has never before been a period in our industrial history when such intense interest has been manifested in the theoretical aspects of metal working and, hence, the need is obvious for a book such as Physics of Metals, by Fredrick Seitz, professor of physics and department head, Carnegie Institute of Technology. The work originated as a lecture course for a group comprising metallurgists with a limited knowledge of physics and physicists with a limited knowledge of metallurgy, and the subject is therefore a fusion of what is common to both sciences. The book is thoroughly modern and discusses the most advanced theories. Common properties of metals like magnetism, conductivity, plasticity, and others, are explained



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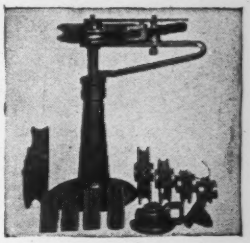

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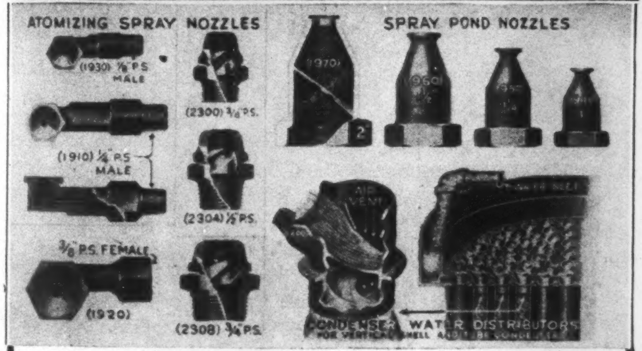

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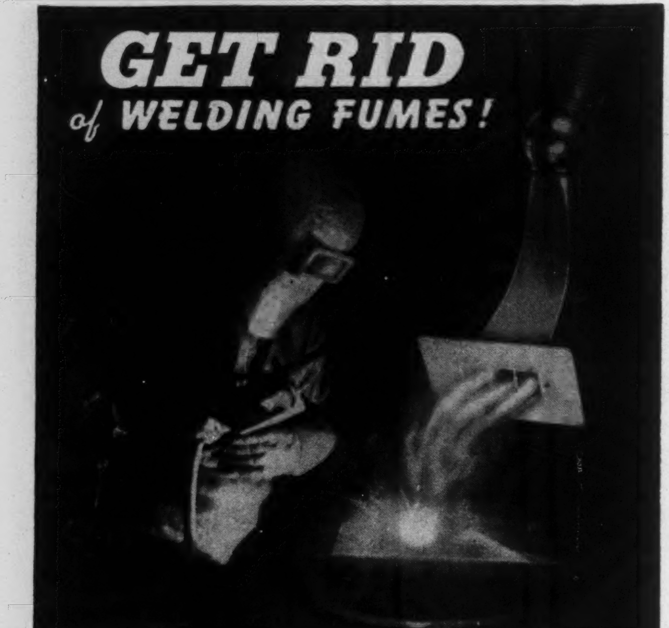

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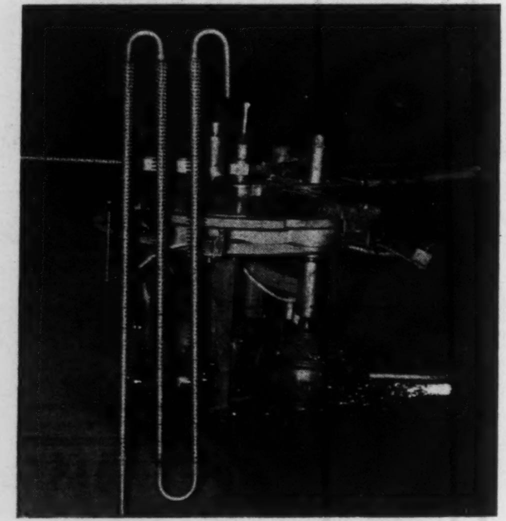

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in terms of atomic characteristics, and the scope of the book is wide, ranging from alloys to the quantum theory. The text is free of complicated mathematics, being restricted to a few simple equations, and most of the data are presented graphically. The price of this 330 page book is $4.00, and the publisher is McGraw-Hill Book Co., 330 W. 42nd St., New York, N. Y.

Materials and Processes

The design engineer is presented with a bewildering array of materials from which to make an object, and an equally diverse number of processes by which to fabricate the raw material into the finished product. The General Electric Co. conducts an advanced engineering course in which products of problem design are discussed and most of the text of the new book, Materials and Processes, which has been arranged by James F. Young of G. E., was taken from lectures given in this course. The first part of this book of over 600 pages is devoted to materials, and considers pure metals, alloys, and plastics, and their properties. The second part discusses the several methods by which metals and plastics are formed, and two concluding chapters deal with inspection and metal finishing. The publisher is John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y., and the price is $5.00.

Mechanical Drive Turbines

The National Electrical Manufacturers Association, 155 E. 44th St., New York, N. Y., released recently a new standard, NEMA Single Stage and Multi-Stage Mechanical Drive Steam Turbines, identified as publication No. 43-88. Covering nomenclature, ratings, pressure and temperature standards, turbine load capacities, overspeed protective devices, relief valves for discharge connections, governing speed by external devices, and standard features and accessories, it should prove useful to consulting engineers, manufacturers, and users. Comprising 12 pages, the price is 50c.

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Dustless Treatment of Coal

A 5 p. information bulletin (No. 6) of Questions and Answers on the Use of Fuel Oils on the Dustless Treatment of Coal was recently issued by Bituminous Coal Research Inc., 803 Southern Bldg., Washington, D. C. After a period of 18 months during which the use of oil or other petroleum products for the dustless treatment of coal was prohibited, the restrictions were lifted on November 12, 1943, by issuance of Amendment No. 1 to petroleum distribution order No. 13 to permit the use of Nos. 5, 6 and bunker C fuel oils having API gravities of 20 deg or below. The characteristics of these oils are so different from those oils previously marketed for coal spraying that, in answer to numerous requests, this information was prepared on the selection and use of these oils. The information given is based on replies from leading oil refiners and from several state insurance inspection and actuarial offices.

Nitrogen Oxide Standard

A standard for the allowable concentration of oxides of nitrogen has been adopted by the American Standards Association, 29 W. 39th St., New York 18, N. Y. It suggests the safe upper limits of these oxides in the air of work places and represents approximately four years of inquiry on the part of the ASA committee on toxic dusts and gases. Copies of the standard are available for 20c from the ASA.

Hot Water Heating Systems

Bulletin No. 349, Performance of a Hot Water Heating System in the IBR Research Home at the University of Illinois, by Alonzo P. Kratz, Warren S. Harris, Maurice K. Fahnestock, and Ross J. Martin, has been issued by the Engineering Experiment Station of the University of Illinois, Urbana. The price of this 74 page booklet is 75c, although copies may be obtained without charge until September 15 or until the supply available for free distribution is exhausted. This bulletin is the first to be published

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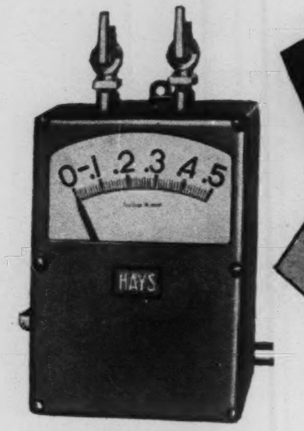

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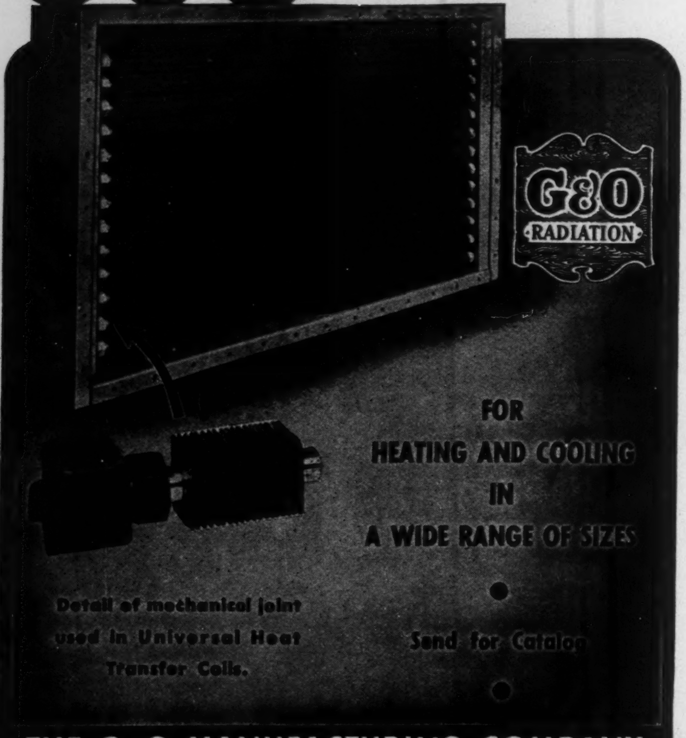

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under a cooperative agreement between the Institute of Boiler and Radiator Manufacturers and the university, and it includes a description of the IBR research home and a discussion of the results of tests made during 1940-41 and 1941-42, using an oil fired, cast iron boiler, supplying hot water to a one pipe, forced circulation, hot water heating system with small tube cast iron radiators.

Weldability of Steels

The American Welding Society, 33 W. 39th St., New York 18, N. Y., has published a 90 page Guide to Weldability of Steels, covering a proposed system of determining the effect of welding procedure on the ductility of the heated zone adjacent to the weld in plain carbon and alloy steels. It is based on extensive investigations of the war metallurgy committee and the welding research council, and "deals with one of the most important problems in the welding industry." There are many tables and charts. The price is $1.00.

Plastics

An unusually practical book, Plastics, by J. H. DuBois, plastics department, General Electric Co., stimulates interest in this class of materials by discussing their nature, properties, and applications, without introducing the complexities of the fundamental chemistry. After a brief outline of history and development, a review of the sources of basic raw materials for each type of plastic and something about the manufacturing processes are given. There are also data on applications of each plastic in industry, and tables of physical and chemical properties which will be found useful by all engineers and designers having to do with the fabrication of new products or redesign of old ones. The publisher of this 435 page book is the American Technical Society, Drexel Ave. at 58th St., Chicago 37, and the price is $3.75.

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Air Compressors

No. 4683—4 p. bulletin (H-620-B21C) on tank mounted, feather valve air compressors, available in two stage and single stage units. Capacity tables and features of construction are given.—Worthington Pump & Machinery Corp., Harrison, N. J.

Aluminum

No. 4684—4 p. issue of Aluminum Progress (Vol. 1, No. 1) including articles on a new source of aluminum in Haiti, use of aluminum in marine construction, postwar growth for aluminum industry, etc.—Reynolds Metals Co., Reynolds Metals Bldg., Richmond 19, Va.

Blind Rivets

No. 4685—36 p. manual (B-44) on blind rivets covering description, installation, tools and inspection, and illustrated with sketches and diagrams. All phases of the process are explained in detail.—Cherry Rivet Co., 231 Winston St., Los Angeles 13, Calif.

Blowoff Systems

No. 4686—12 p. booklet (4081) on continuous blowoff systems illustrating the application of such heat saving devices for the boiler room. The heat saving that can be accom-

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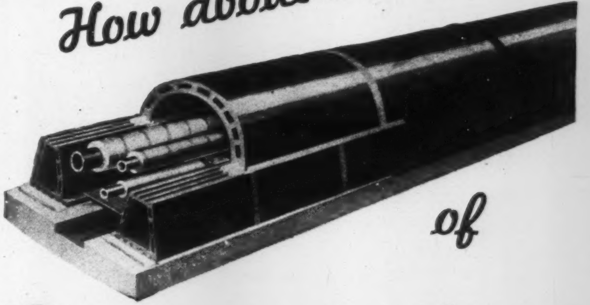

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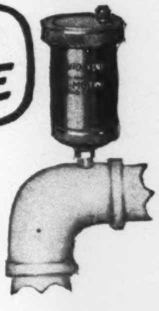

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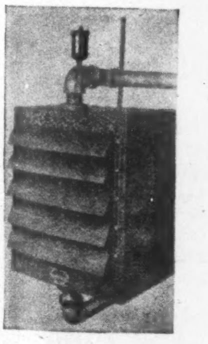

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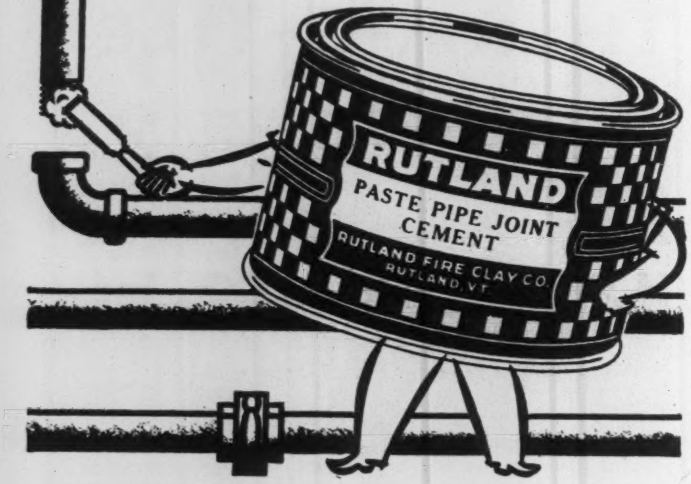

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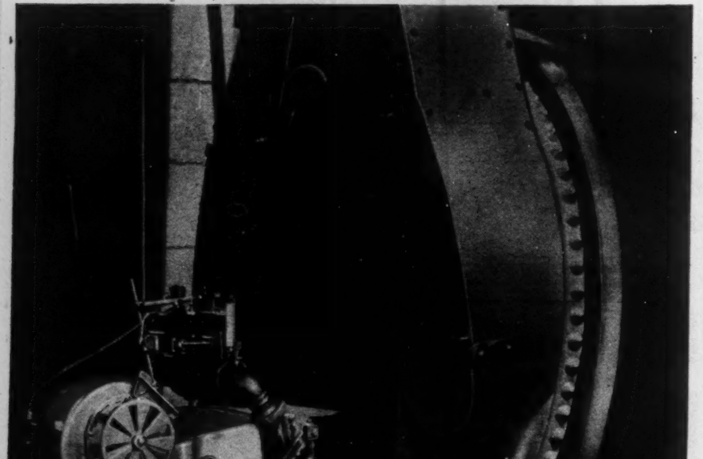

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Boiler Baffles

No. 4687—4 p. bulletin on "Economy" boiler baffles, explaining and illustrating how economy can be effected by proper design, and giving sketches showing old and new location of baffles, together with savings made in each case.—Ramtite Co., 2563 W. 18th St., Chicago 8, Ill.

Brazing Alloy

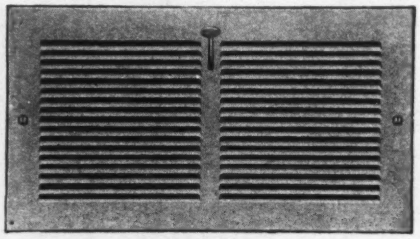
No. 4688—16 p. bulletin (14) on how to prepare broken cutting tools with "Easy-Flo" low temperature silver brazing alloy.—Handy & Harman, 82 Fulton St., New York 7, N. Y.

Condensate Purity Instruments

No. 4689—24 p. catalog (N-95-163) on "Micromax" condensate purity instruments for the steam plant, with information on means of preventing contaminated condensate from reaching boilers and prime movers, explaining how condensate is sampled continuously by means of a conductivity cell and its purity indicated and recorded automatically.—Leeds & Northrup Co., 4970 Stenton Ave., Philadelphia 44, Pa.

Degasification of Water

No. 4690—18 p. bulletin (4076) on the degasification of water, illustrating the various types of equipment available for removal of gases from water at various temperatures. Means for removal of oxygen and carbon dioxide without use of steam are illustrated, and information is given on removal of small quantities of ammonia and removal of hydrogen sulphide and carbon dioxide simultaneously.—Cochrane Corp., 3131 N. 17th St., Philadelphia 32, Pa.



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& GRILLES · For Air Conditioning and Gravity

Electronic Controllers

No. 4691—Bulletin (B220) describing new line of free vane electronic controllers for automatically controlling temperature, pressure, liquid level, and humidity. Wiring diagrams, principle of operation, and general features of these new instruments are covered.—Bristol Co., P. O. Box 1790, Waterbury 91, Conn.

Ion Exchange Process for Water Purification

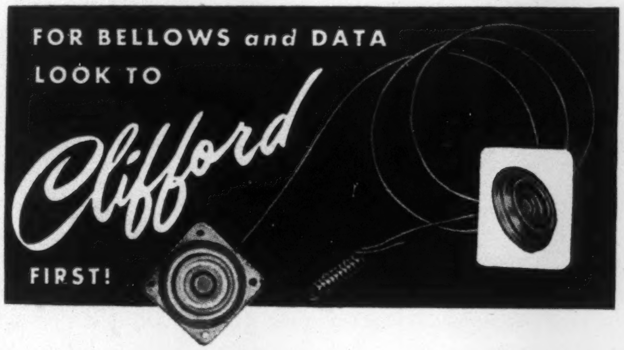
No. 4692—6 p. bulletin (W-212-B4) on the ion exchange process for the purification of water. Purification is accomplished by contact with a granular insoluble material which imparts unobjectionable ions to water in exchange for "hardness" or other ions of an objectionable nature. Equipment is described and illustrated.—Worthington Pump & Machinery Corp., Harrison, N. J.

Low Temperature Welding

No. 4693—Issue of The Eutectic Welder (Vol. 1, No. 4) including articles on importance of maintenance welding in production, welding galvanized water pipe without destroying the zinc coating, and various short, practical items.—Eutectic Welding Alloys, Inc., 40 Worth St., New York 13, N. Y.

Mass Production Tooling

No. 4694—16 p. booklet describing new "Mult-Au-Matic" which, according to the manufacturer, offers for the first time mass production tooling for work as large as 34 in. in diameter, and is said to be the first machine of its size to be a planned production unit for machining work up to this diameter and up to 23 in. in height.—Bullard Co., 286 Canfield Ave., Bridgeport 2, Conn.



WHERE ACCURACY and long life count, *hydraulically-formed* metallic bellows are the answer. And Clifford's Hydron Bellows, *the first hydraulically-formed bellows ever produced for industry,* still rank first when the accent is on engineering skill.

Clifford's 44-page Hydron Bellows Data Book explains why so many big names in industry get bellows and bellows assemblies for temperature and pressure control from the engineers who are always *first with the facts.* Write for this authoritative Data Book today.

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FLOAT and THERMOSTATIC TRAPS

These Traps are designed to take care of any low pressure job up to 15 lbs. They will not become air bound as they employ the Bourdon Tube on the by-pass. Our underslung valve principle makes it safe at all times. No danger building up a pressure with this type of valve.

Furnished in sizes ¾", 1" and 1¼".

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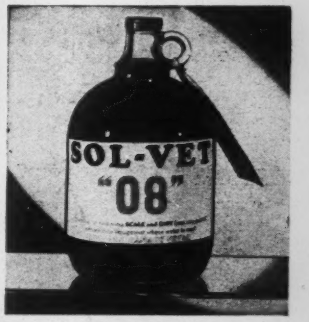
ON COOLING TOWERS and CONDENSING UNITS with SOL-VET "08"



Find Out How This Water Treatment Formula Can Prevent Costly Scale and Slime in Your Equipment

● If scale, slime, rust, algae are clogging up the lines of your cooling towers, condensers and other heat exchanger equipment look into the advantages of SOL-VET "08" service.

SOL-VET, highly recommended by leading engineers, offers you the facilities of one of the best equipped water laboratories in the United States. Thorough testing of your water can help determine the right SOL-VET "08" Cleaner that will prevent clogging—boost equipment capacity, save needless shutdowns for overhauling. Write today for complete data on SOL-VET "08" with free analysis and recommendations for your specific problems of removing scale and dirt.

Remember that if you find SOL-VET "08" is not exactly as represented—when used according to instructions, and full accurate report is given within 30 days from date of purchase—your money will be refunded in full.

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☐ Please send complete data on SOL-VET "08".
☐ We are forwarding water sample and mechanical data—please send analysis and recommendations.

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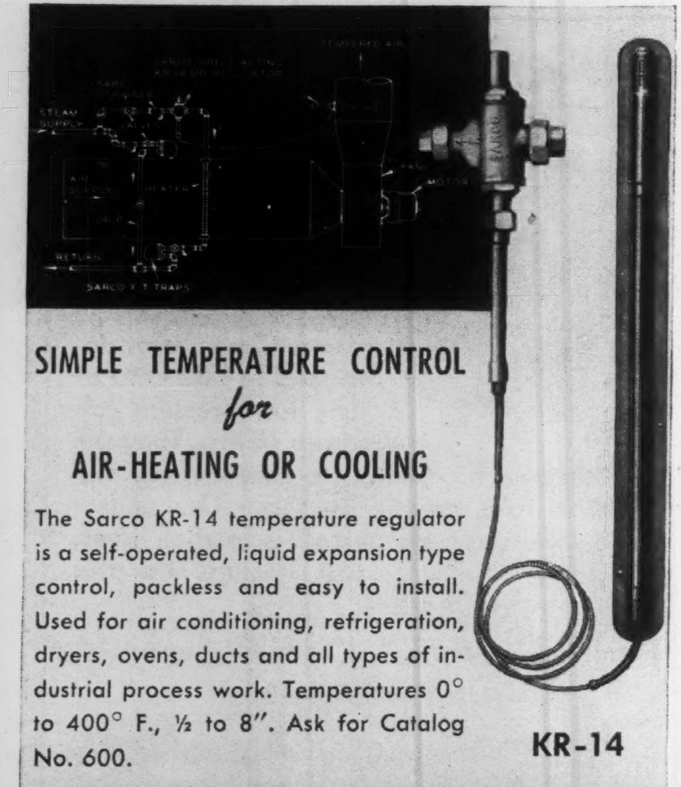


SIMPLE TEMPERATURE CONTROL *for* AIR-HEATING OR COOLING

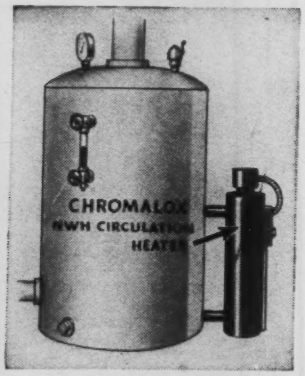
The Sarco KR-14 temperature regulator is a self-operated, liquid expansion type control, packless and easy to install. Used for air conditioning, refrigeration, dryers, ovens, ducts and all types of industrial process work. Temperatures 0° to 400° F., ½ to 8". Ask for Catalog No. 600.

KR-14

SARCO SAVES STEAM

SARCO COMPANY, INC.
475 Fifth Avenue, New York 17, N. Y.
SARCO CANADA LTD. 85 Richmond St. W., TORONTO, ONT.
172

Shut down main boilers—make local process steam ELECTRICALLY



Boilers big enough for winter heating are uneconomically used only for process steam—
Save manpower and fuel with electric steam generators, located "on the job"—
Provide a tank equipped with usual boiler accessories—
Connect to it a

CHROMALOX
NWH Circulation Heater

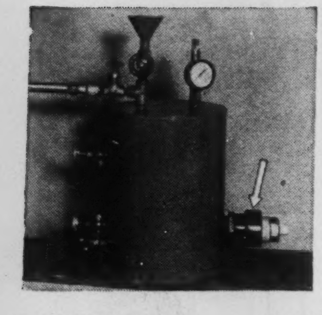
This unit is complete with insulating jacket and thermostatic switch. Needs only two pipe connections.

•

Another method: Weld a tapped boss to side of boiler—
Insert a standard Chromalox immersion heater into boiler, screwed into boss. (See photo at left).

Many plants using small steam generators like these, have found them so economical and convenient that they are used all year 'round.

In selecting heating units of correct capacity, check with us, giving required steam volume and pressure. Our engineers are glad to work with you on any problem of industrial electric heat. Chromalox Catalog on request.



EDWIN L. WIEGAND COMPANY
7610 Thomas Blvd. Pittsburgh 8, Pa.

Motors

No. 4695—2 p. data sheet on motors of steel construction, giving brief specifications and illustrations.—Century Electric Co., 1806 Pine St., St. Louis 3, Mo.

Noise

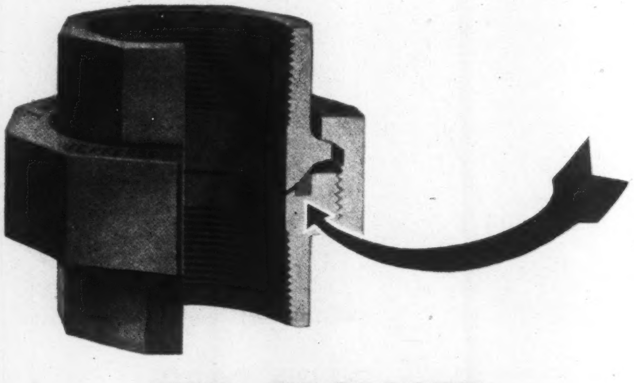
No. 4696—44 p. Noise Primer, by H. H. Scott, containing a wealth of valuable data on noise and including parts on the sound level meter, the decibel, how to use the sound level meter, practical application of such meters, noise analysis, the sound analyzer, accuracy in noise measurements, vibration, the vibration meter and how to use it, analysis of vibration, and how to use the vibration analyzer. The appendix includes decibel tables.—General Radio Co., Cambridge, Mass.

Pipe Fittings

No. 4697—Comprehensive 96 p. catalog (5-B) on cast iron, malleable, steel, and bronze pipe fittings, and featuring a quick guide to the entire line which makes it easy to find a complete "family" or a specific fitting. List prices and illustrations are given for the numerous fittings covered. There is also detailed information on flanges and numerous items of miscellaneous equipment such as bolts, nuts, gaskets, thread cutting oil, pipe joint compound, service clamps, etc.—Grinnell Co., Inc., 260 W. Exchange, Providence, R. I.

Refrigeration System Gas Purgers

No. 4698—8 p. bulletin (160) on non-condensable gas purgers for removing air and other gases from refrigeration systems. Typical subjects discussed include effect of excess head pressures on power costs, causes of high condenser pressure, sources of non-condensable gases, and how to tell when purging is needed. Operating principle of the purger, installation diagrams, prices, and physical data, and other information are included.—Armstrong Machine Works, 874 Maple St., Three Rivers, Mich.



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the standard of quality
for over forty years.

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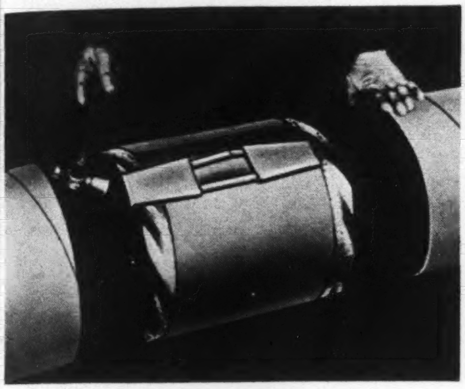
EQUIPMENT DEVELOPMENTS

For your convenience in obtaining more information about any of this equipment, see coupon on this page. Add the new products and companies listed here to your Directory Section which you received in your January 1944 Heating, Piping & Air Conditioning and thus keep your records of sources of supply up to date throughout the year. Single asterisk indicates equipment not listed in Directory Section; double asterisk equipment and manufacturer not listed.

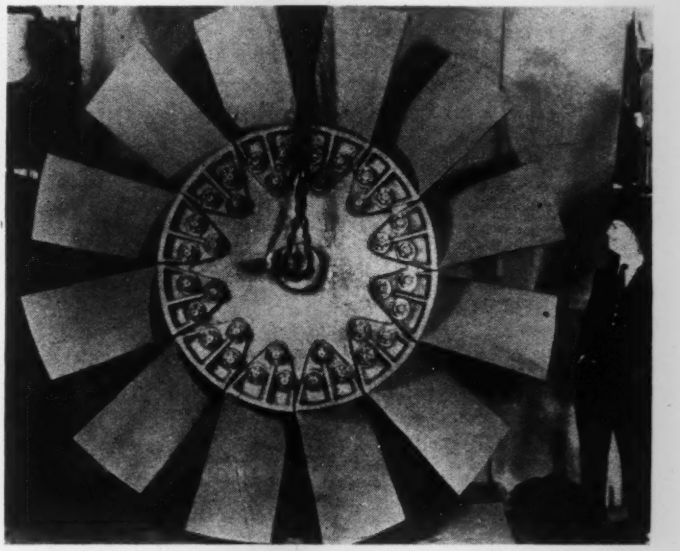
Coupler Speeds Field Assembly of Pipe Conduit

No. 2614—Making final field connections on prefabricated insulated pipe conduit has been facilitated by a drive coupler which eliminates need for skilled workmen and reduces installation time, says the manufacturer. The coupler is adaptable to a mechanical or welded closure. This conduit is shipped to the job in 21 ft sections completely prefabricated with pipe or pipes, insulation, and aligning pipe supports. Ends of the helical corrugated conduit are expanded smooth at the factory, removing corrugations for a distance of 3 in., and bare pipe extends beyond the ends of the conduit for three more inches. After the pipe has been coupled or welded, and insulation applied over the exposed portions, smooth ends of the conduit are coated with waterproof sealing cement. A heavy gage split connector sleeve is then slipped over the opening, and clamps are driven onto wedge shaped channels over the lapped joint, making a strong watertight mechanical coupling. Where a welded closure is required, cement is omitted and the ends of the sleeve are lap welded to the conduit after the clamps have been applied. The clamps are then removed and the longitudinal seam lap welded. For extra strength, clamps may again be driven onto channels after weld is made. When conduit coupling is completed, an asphalt blanket, applied with heat over the entire closure area, fuses with the factory applied asphalt to "assure uniform protection at all times."—Ric-wiL Co., 1562 Union Commerce Bldg., Cleveland 14, Ohio.



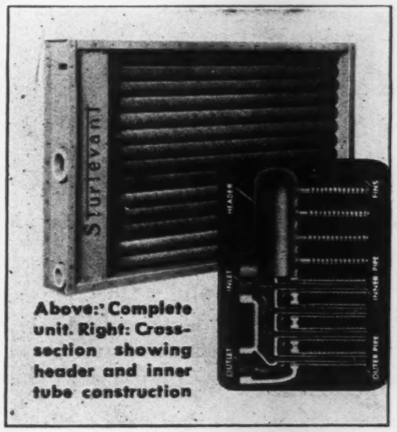
Stainless Steel Mine Fans

No. 2615—The deep underground workings of the International Nickel Co. of Canada, Ltd., require handling of large quantities of ventilation air and owing to the length of the ventilation system it has been necessary to introduce booster fans within the circuit on the lower levels of the mines. The illustration shows part of a large underground circulating fan made of stainless steel (17½ to 20 per cent chromium, 10 to 14 per cent nickel, 3 to 4 per cent molybdenum) built by Canadian Blower & Forge Co. As this fan must operate continuously in a location where repairs or maintenance are difficult and where shutdown periods would mean lost production, it was essential that the possibility of failure due to the corrosive and erosive effect of acid mine waters be eliminated, which is why the stainless steel alloy was chosen, according to International Nickel Co., Inc., 67 Wall St., New York 5, N. Y.



Heavy Duty Steel Heater

No. 2616—A new heater for heavy duty applications in industrial heating, air conditioning, vapor absorption, drying, and other processing work possesses the maintenance and repair free advantages of pipe coil heaters combined with the performance of modern heating surface, which has an increased heating capacity of 10 times due to the use of fins, says the manufacturer. These heaters are con-



Above: Complete unit. Right: Cross-section showing header and inner tube construction

Heating, Piping & Air Conditioning, [6-44]
6 N. Michigan Ave., Chicago 2, Ill.

Please ask the manufacturers to send me more information about the equipment mentioned under the following reference numbers in Equipment Developments and Recent Trade Literature.

(Circle each number in which you are interested)

2614	2615	2616	2617	2618	2619	2620	2621	2622	2623
2624	2625	2626	2627	2628	2629	2630	2631	2632	2633
2634	2635	2636	2637	2638	2639	2640	2641	2642	
4699	4700	4701	4702	4703	4704	4705	4706	4707	4708
4709	4710	4711	4712	4713	4714	4715	4716	4717	4718
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Company ....

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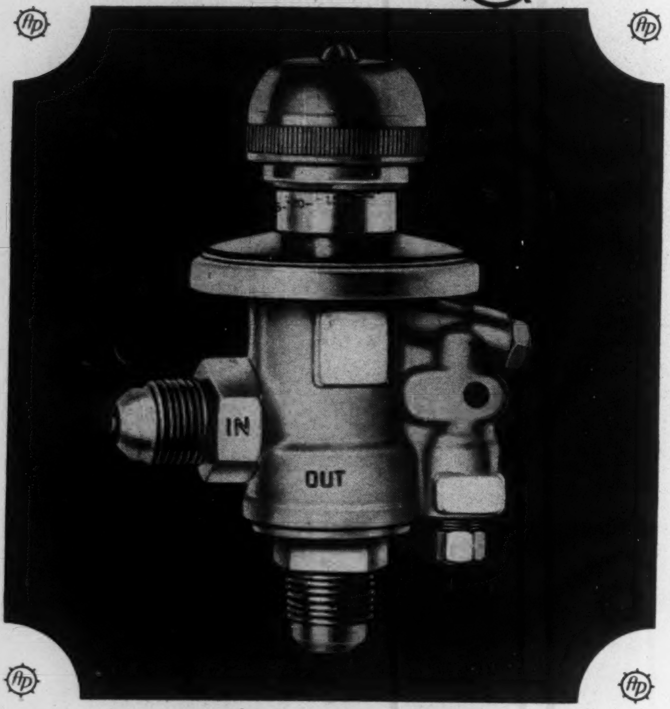
Dependability doesn't happen...

IT'S ***BUILT INTO*** EVERY AP VALVE



AP Model 235 Suction Pressure Regulating Valve

Used to regulate pressure at the tail of the evaporator, Model 235 is particularly valuable where two or more evaporators must be operated at different temperatures from a single condensing unit. Maintains evaporator temperature within close limits.

It has a graduated pressure scale, and adjusting range from 10″ vacuum to 30 pounds. Furnished complete with shut-off valve for pressure recording gauge, it can be used on flooded, semi-flooded or dry expansion types, in capacities up to ½ ton Freon, or ¾ ton Methyl or Sulphur.

AUTOMATIC PRODUCTS COMPANY

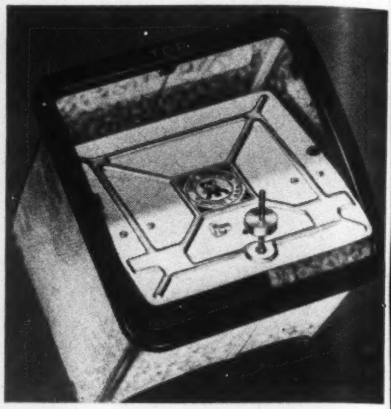
2460 North Thirty-Second Street • Milwaukee 10, Wisconsin
Export Dept. — 13 East 40th Street, New York 16, New York

AP

DEPENDABLE
REFRIGERANT VALVES

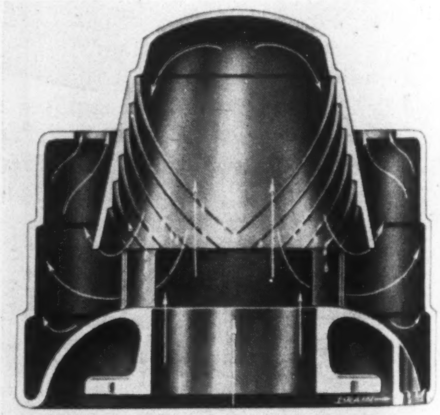
structed of 1 in. standard steel pipe threaded into cast iron headers; inside the pipes are ⅜ in. steel pipes which carry the steam from the header, distribute it uniformly, prevent air binding and provide a nonfreeze characteristic. Wound around the heater pipes are spiral fins made of soft carbon steel strip tapered in thickness from the edge attached to the pipe to the outside edge. Four sizes are available—20, 25, 30, and 35 in. in width across the pipes—and each size can be furnished in pipe lengths from 2 ft to 10 ft in 6 in. increments.—B. F. Sturtevant Co., Damon St., Hyde Park, Boston, Mass.

Barometric Draft Control

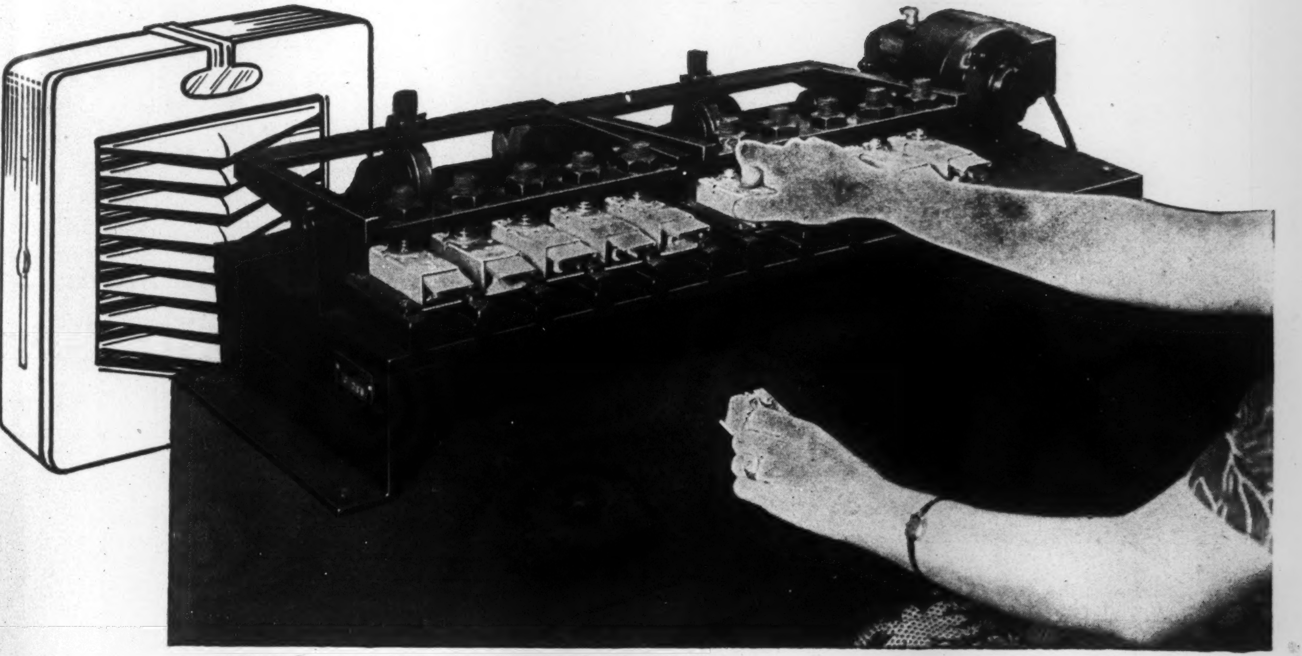


No. 2617*—A new series of barometric draft controls has a number of features, according to the manufacturer, including a new type of hinge pivot made of spring steel which eliminates binding and sticking difficulties due to sediment or guminess. This feature assures permanent calibration after the initial setting, it is stated. Square construction of the vane and the thimble channel "allows 20 per cent greater air volume." The vane itself is made of aluminum for lightness, which contributes to precision action and sensitivity. Four models for installation in pipes ranging from 6 to 12 in. are available.—Perfex Corp., 500 W. Oklahoma Ave., Milwaukee 7, Wis.

Cast Iron Exhaust Head



No. 2618—A new free flow exhaust head embodies principles for the complete separation of oil and water from exhaust steam and has two special advantages, according to the manufacturer. By removing all moisture before steam is blown out, it eliminates water spray which is one of the principal causes of rust or erosion of roofs, smokestacks, or other parts of buildings. Also, it is said to eliminate the objectionable noise associated with exhaust head operation. Directional vanes are cast on the inside of the head to collect and carry the separated moisture and oil out of the steam flow. For complete elimination of these contaminants, the normal steam velocity is slowed down by a two stage expansion of the steam,



"RUN IN" LIKE A QUALITY MOTOR CAR . . .

8 EXCLUSIVE FEATURES OF WHITE-RODGERS HYDRAULIC-ACTION TEMPERATURE CONTROLS

1. May be mounted at any angle or position, above, below or on level with control point.

2. Hydraulic-Action Principle incorporating solid-liquid filled bulb and capillary provides expansion force comparable to that of a metal bar.

3. Diaphragm motion uniform per degree of temperature change.

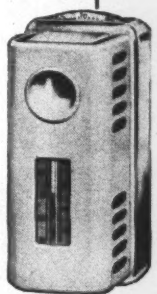
4. Power of solid-liquid charge permits unusually sturdy switch construction resulting in positive contact closure.

5. Heavier, longer-wearing parts are possible because of unlimited power.

6. Dials are evenly and accurately calibrated over their entire range because of straight-line expansion.

7. Controls with remote bulb and capillary are not sensitive to change in room temperature. Accuracy of control is not affected by temperature changes in surrounding area.

8. Not affected by atmospheric pressure. Works accurately at sea level or in the stratosphere without compensation or adjustment.



to assure accurate performance the moment it is installed

Hour after hour this specially designed cycling machine breaks in White-Rodgers control-switch mechanisms. Each is operated for not less than five hundred cycles to assure smooth, uniform contact action.

Just another reason why White-Rodgers Controls are accurate when you install them—need no recalibration due to flexing of moving parts or seating of bearing surfaces.

Specify White-Rodgers to assure dependability and freedom from trouble.

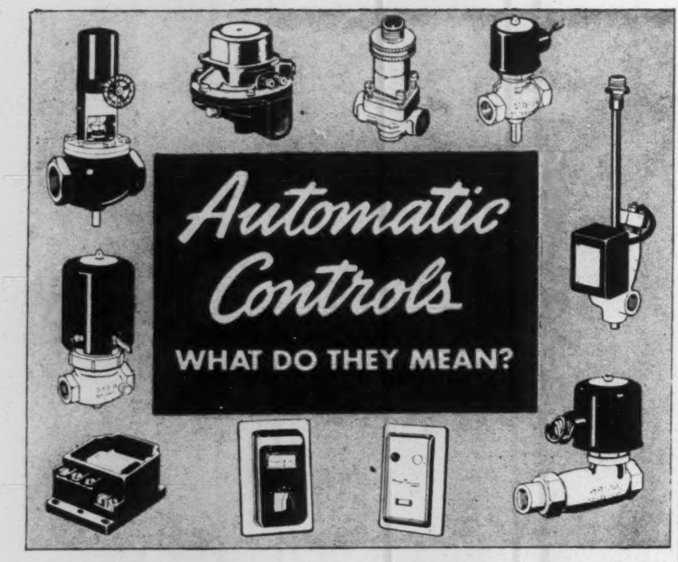
HYDRAULIC ACTION CONTROL

MEMBER I.C.I. INDOOR CLIMATE INSTITUTE

WHITE-RODGERS
ELECTRIC CO.

1205F Cass Ave. St. Louis, Mo.

Controls for Refrigeration • Heating • Air-Conditioning



Automatic controls of pressure, temperature and flow assure *pre-determined accuracy of results* wherever they are used. No thinking executive, production manager or maintenance engineer can miss the full significance of this statement.

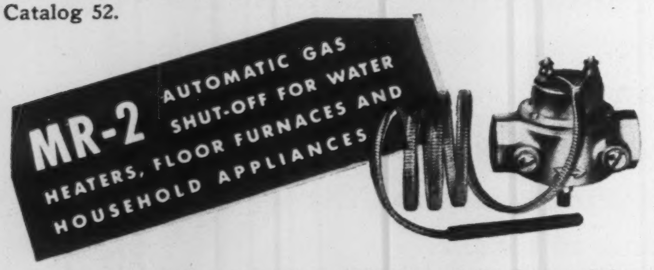
In factories and plants of every size and kind, *automatic controls* increase productive output and reduce waste by simplifying operations, speeding work, and assuring uniformity of finished product. With controls, even the most inexperienced novices quickly attain proficiency.

In homes and buildings, large and small, *automatic controls* promote economy, comfort, health by providing optimum temperature and humidity, saving fuels and doctors' fees.

On stationary equipment such as presses, machine tools, internal combustion and diesel engines, *automatic controls* save materials, plumbing, space, time and money.

On moving equipment such as aircraft, ships, tractors, trucks, tanks, locomotives, **hi-g** *light-weight controls* assure efficient performance because they operate in any position, regardless of vibration, change of motion or acceleration. **hi-g** saves weight and space.

Although now engaged full-time in supplying war needs, General Controls' staff of "straight-thinking" engineers invite your request for help in solving your post-war control problems. For complete description of General Controls' broad line of automatic pressure, temperature and flow controls, write for Catalog 52.

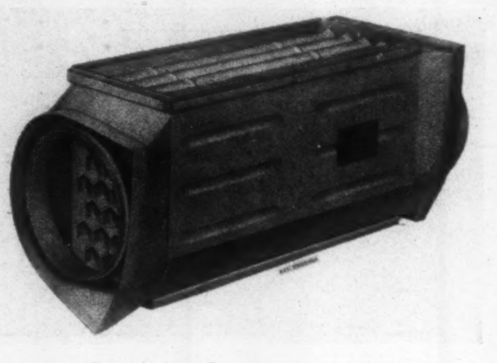

MR-2
AUTOMATIC GAS SHUT-OFF FOR WATER HEATERS, FLOOR FURNACES AND HOUSEHOLD APPLIANCES

Necessary valve operating current is supplied by heat of pilot flame applied to thermocouple element. Failure of flame automatically closes valve which can be again opened by convenient push button. MR-2 is straight through gas type. Standard thermocouple length 30". Valve sizes: ⅜" to 1½". Available for manufactured or liquefied petroleum gases.

first in the dome and again in the body surrounding the dome. An outlet opening much larger than the area of the intake "permits the exhaust to escape easily without back pressure." This exhaust head is made for all pipe sizes from 1½ to 14 in.—Wright-Austin Co., 315 W. Woodbridge St., Detroit 26, Mich.

Exhaust Heating Unit

No. 2619—An exhaust heating unit for airplane and industrial applications—known as the "Hexheat"—is of tube construction, scientifically proportioned and balanced to give uniform air flow control, says the maker. Air flow can be arranged across flow, cocurrent flow, or counterflow, whichever may be most desirable and efficient for the condition involved. Originally designed to meet aviation needs for utilization of exhaust heat, the unit is said to be adaptable to a wide variety of industrial uses. Modifications can be made to meet special operating and space limitations.—Drayer & Hanson, Inc., 738 E. Pico Blvd., Los Angeles 21, Calif.

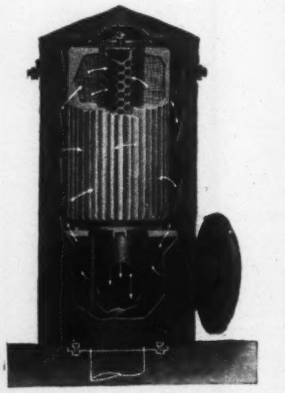


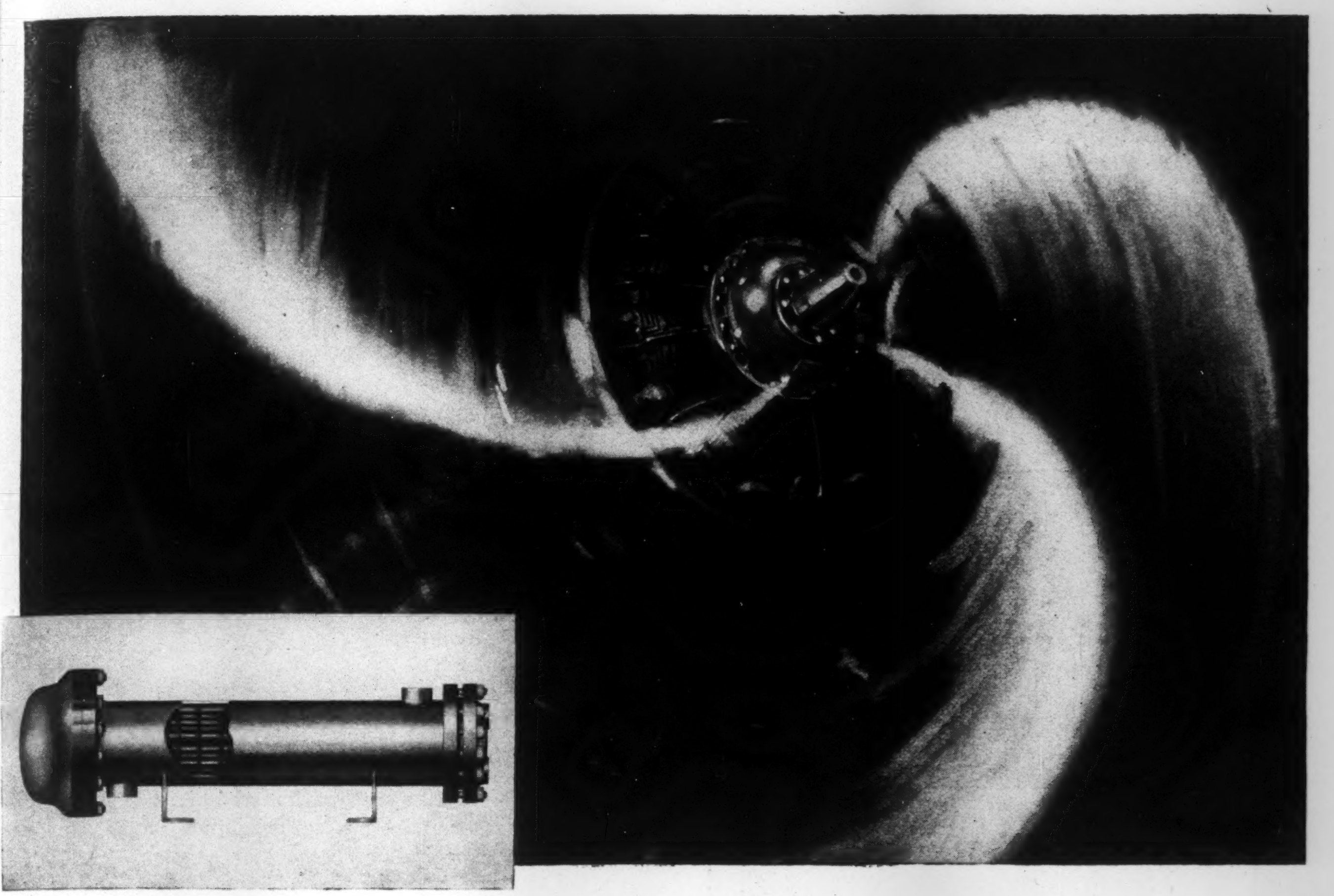
Air Conditioners for Radio Trucks

No. 2620—Marine Corps trucks used in advance bases for radio unit work are air conditioned for protection of men and equipment by a new type of portable dehumidifying unit, with a capacity of over 2 tons. It will maintain an 80 F temperature and 50 per cent relative humidity in the conditioned area, according to the manufacturer, and each of the units is self-contained, semi-automatic, and weighs one ton. The unit is mounted on its own trailer.—York Corp., Roosevelt Ave., York, Pa.

Intake Air Filter

No. 2621—A new intake air filter for compressors and internal combustion engines may be installed and serviced at ground level—right in the engine room itself, if preferred—while the air intake opening may be located elsewhere at the most suitable point, says the manufacturer. The filter provides the advantages of the manufacturer's dry type intake filters, including radial fin construction, and combination silencer and filter models are available. Servicing is simple as the filter insert can be lifted out through a removable panel and cleaned by brushing, by compressed air, or by washing.—Dollinger Corp., 11 Centre Park, Rochester 4, N. Y.





How to speed up aircraft engine testing

AIRCRAFT engines as they come from the assembly line must be tested thoroughly under actual operating conditions. Heat in the wrong place at the wrong time can seriously delay production.

For instance, the engine is placed in test cells and connected to fuel and oil lines. If the oil is cold, time is lost while heat is added to bring the temperature of the engine to actual operating conditions. On the other hand, as one engine after the other is tested, heat is added to the oil. Thus actual operating conditions are destroyed. More time is lost while the heat in the wrong place is dissipated.

To make heat an aid rather than a time waster, one large aircraft engine maker installed Trane Shell and Tube Heat Exchangers. These versatile heat exchangers apply steam to warm the oil to proper temperature before testing operations begin. Then, reversing themselves, they constantly keep the temperature of oil at actual operating conditions by cooling it with cold water. In this way, aircraft engines are tested in the quickest possible manner.

Actually, heat is exchanged for more aircraft engines.

The Shell and Tube Heat Exchanger is but one of the many products of The Trane Company, manufacturing engineers of heating, cooling and air handling equipment. This application is but one of hundreds to which Trane Products are being applied in today's battle of production. Tomorrow Trane Products using the same principles of heat exchange will be applied to processes that will make a better world in peace.

TRANE

AIR

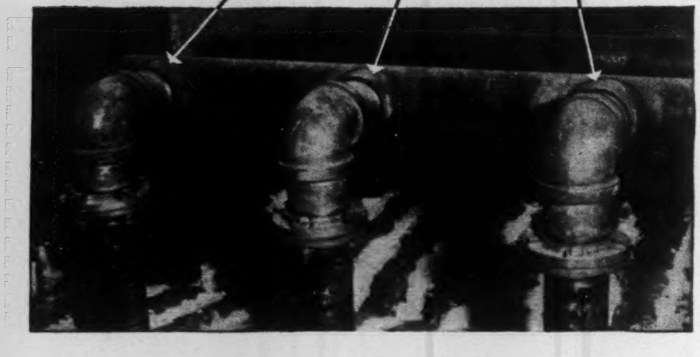
THE TRANE COMPANY LA CROSSE, WISCONSIN

TRANE COMPANY OF CANADA, LTD., TORONTO

AIR CONDITIONING · · HEAT TRANSFER · · AIR HANDLING EQUIPMENT

WeldOlets are available in three types—with Welding Outlet, Threaded Outlet (illustrated at right) and Socket Outlet. Stock fittings are drop forged steel. Also available in Monel, Everdur, Toncan Iron, Wrought Iron, etc.

Here's the simple way to install branch pipe outlets



● On this piping installation the three branch pipe outlets were installed quickly and easily by the WeldOlet method. The elimination of any templates or the need for any cutting, forming or fitting, speeded and simplified the installation.

These drop forged fittings reinforce the junction so that the original strength of the main pipe is maintained. In addition, the extra large funnel-shaped opening, in the fittings where they join the pipe, cuts pressure loss and reduces turbulence and friction. The WeldOlet method is speedy and low in cost for both size to size or reducing branch pipe outlets. Size to size and reducing sizes are available from ¼" to 12". For complete information write for Branch Pipe Outlet Catalog WT31.

Forged Fittings Division

Bonney Forge & Tool Works • 350 Green St. • Allentown, Pa.

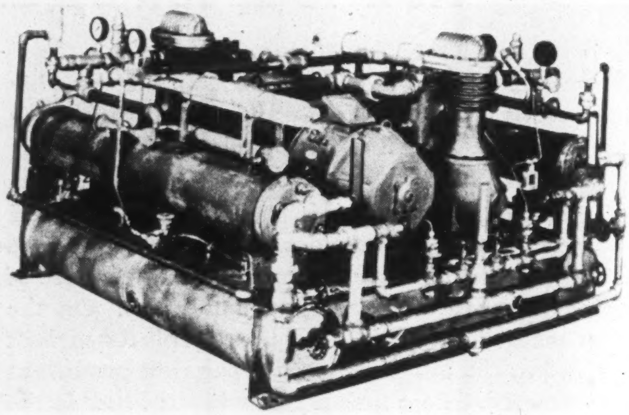
WELDOLETS
WELDING OUTLET - THREADED OUTLET - SOCKET OUTLET
For Welded Branch Pipe Outlets

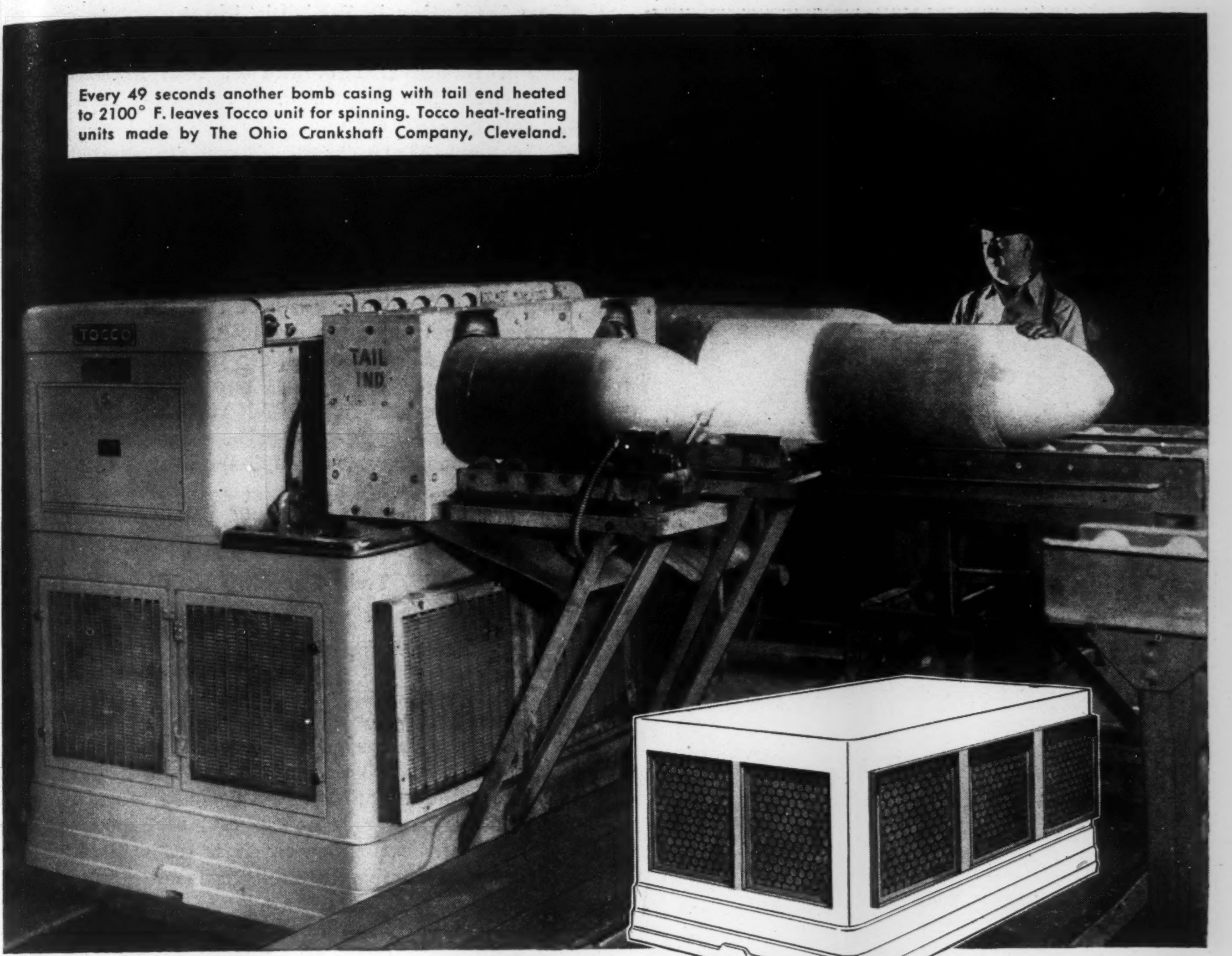
Electronic Heating Controls

No. 2622—Electronic controls so sensitive they react to the heat of a person's hand will eliminate, in the not too distant future, cold floors and drafts, according to John E. Haines, chairman of the postwar planning committee, Minneapolis-Honeywell Regulator Co., 2701 Fourth Ave., S., Minneapolis, Minn., in a talk in Washington, D. C., last month. The urgencies of war have stimulated research to the extent that within a period of three years electronic developments have reached a stage of advancement which might have otherwise required 10 to 15 years to obtain, he said. Electronic controls, he continued, will be valuable in connection with air conditioning and heating both industrial plants and homes since they react to minute temperature variations. Use of electronics combined with present day temperature control equipment will mean greater comfort, convenience, and safety. While electronic control equipment today "would cost nearly twice as much as equivalent electric or pneumatic equipment, the cost is being constantly reduced and in the near future any additional cost—if it exists—will be more than offset by the improved results which will be obtained," he concluded.

Refrigeration Unit for Victory Ships

No. 2623—A compact packaged refrigeration plant, designed for installation on Victory ships, combines twin refrigeration compressors, receivers, condensers, and all auxiliaries which, by means of cross connections, can be operated separately on both high and low temperature rooms. In emergencies either compressor can be connected to carry both high and low temperatures simultaneously. Refrigerant receivers form integral structural part of the base, increasing the rigidity of the framework at minimum weight. All piping and valves are located for easy accessibility. With the exception of piping connections to cooling coils and water supply, the apparatus is ready to use when shipped. The unit mounts two 2 cylinder "Balanseal" refrigeration compressors with a combined capacity of five tons. The compressors are driven by two 7½ hp motors. The thermal expansion valve, solenoid valve, hot gas defrosting valves, thermostat, and dial thermometers are all compactly arranged in flush mounted cabinets 24 in. square by 6 in. deep with necessary connections to the compressor and cooling coils.—York Corp., Roosevelt Ave., York, Pa.





Every 49 seconds another bomb casing with tail end heated to 2100° F. leaves Tocco unit for spinning. Tocco heat-treating units made by The Ohio Crankshaft Company, Cleveland.

What keeps Tocco's insides clean?

TOCCO IS A MACHINE to heat-treat steel by electrical induction.

Tocco units make better bomb cases faster. Heat airplane propeller ends to 2000° F. in 115 seconds. Increase output of drill chucks 600 per cent. In sum, bring to hundreds of manufacturing plants faster production, lower costs and improved products.

Tocco's insides consist of expensive, precision machinery. A motor-generator is its heart. To assure proper operating temperature for the enclosed electrical equipment, air is fan-circulated throughout the cabinet. This air must obviously be clean as a whistle. Dust-Stop* Air Filters inside the intake louvres (see inset) make it that way.

Saves Possible Expense

Dust-Stops are one of the contributing factors to Tocco's remarkably low maintenance costs, made possible by careful design and engineering of the complete unit.

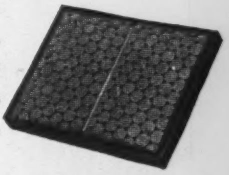
All users of machinery equipped with Dust-Stops have the advantages of a quick-change, standard size filter that can be easily removed when clogged with dirt accumulations and replaced with a new, clean Dust-Stop in a few minutes.

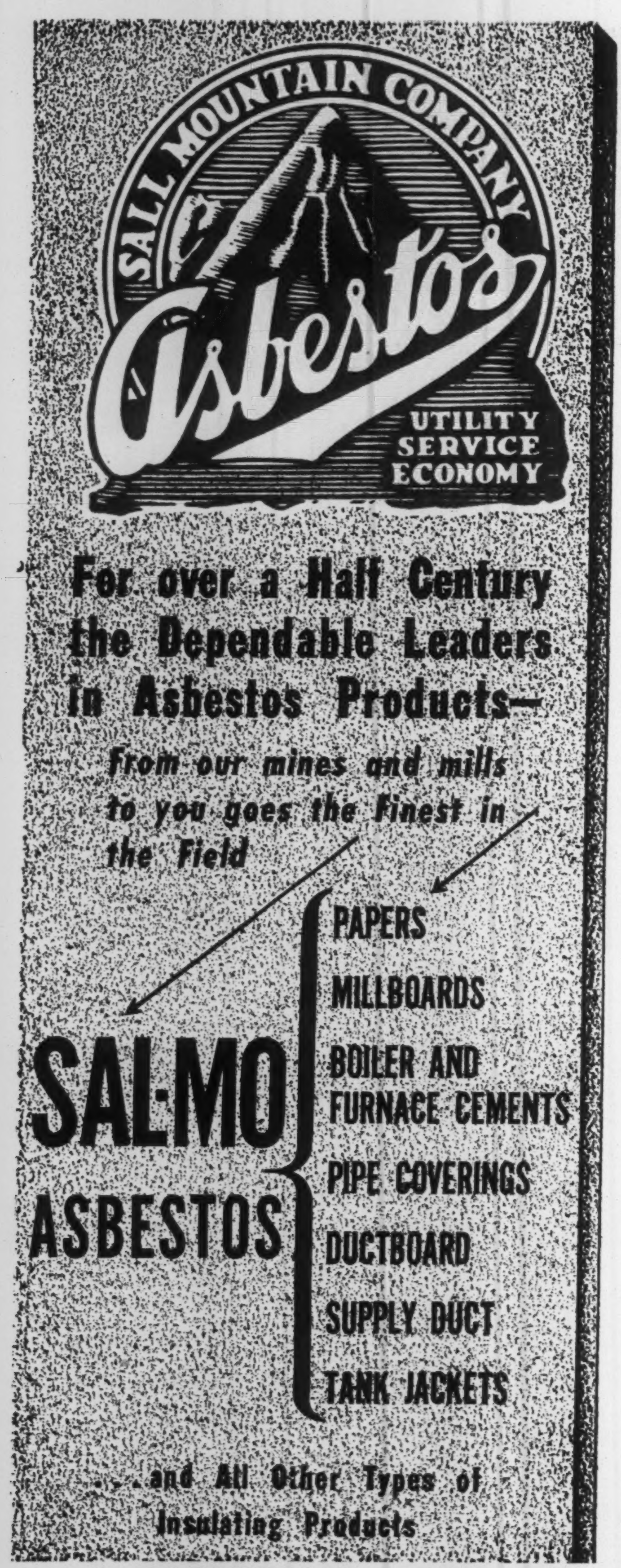
Tocco is but one interesting example of how Dust-Stops can be designed and engineered into machines where dust must be controlled. For further information on this type of application write: *Owens-Corning Fiberglas Corporation, 1911 Nicholas Building, Toledo 1, Ohio; Fiberglas Canada, Ltd., Oshawa, Ontario.*

ARMY E NAVY

FIBERGLAS* DUSTOP AIR FILTERS

*T. M. Reg. U. S. Pat. Off





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Glass Insulation in Penicillin Plant

No. 2624—In a penicillin plant to be operated by Cheplin Biological Laboratories, Inc., insulation has been relied upon as an element in the air conditioning and refrigeration system design. Interior walls in areas of the plant where closest atmospheric control is required have a 1 in. thickness of "Fiberglas" insulation as backing against the ceramic tile facing the critical area, and an air space of 11 in. is provided between the two sections of ceramic tile. This provides an open space from basement to roof slab in which air conditioning ducts and piping can be run. All outside walls of areas requiring atmospheric control have two 2 in. layers of the insulation between the exterior section of brick and hollow tile and the interior section of clear glazed ceramic tile. A 30 lb felt vapor seal between the insulation and the interior wall section prevents transmission of moisture. Although the overall thickness of the wall is only 19 in., the overall coefficient of heat transmission is said to be 0.066 Btu.—Owens-Corning Fiberglas Corp., Nicholas Bldg., Toledo, Ohio.

Small Capacity Twin Pumping Unit

No. 2625—A new twin pumping unit comprises two standard pumps mounted on a cast bedplate and connected through semi-enclosed reduction gears to an electric motor. Pump constructions available are all iron, bronze fitted, or all bronze. Capacity of each pump is 3 gpm at a discharge pressure of 100 psi, and pump speed is 570 rpm. This unit is designed to handle fuel oil, lube oil, and similar liquids. Units are to be available later in larger capacities and high pressures for industrial applications where it is desirable to handle two different liquids through the same pumping unit simultaneously. Twin units are available with clutches to permit either alternate or simultaneous pump operation.—Blackmer Pump Co., 1920A Century Ave., S.W., Grand Rapids 9, Mich.

Heating Control for Apartment Building

No. 2626—Improved comfort for apartment house dwellers, combined with substantial savings in operating costs, is made possible by a new heating control system, demonstrated to the press for the first time last month by Arnold Michelson, vice president of Minneapolis-Honeywell Regulator Co., 2701 Fourth Ave., S., Minneapolis, Minn. He said it will eliminate drafts and other discomforts, reduce heating costs, and provide a new rental attraction. The controls which make personalized heating possible may be installed in existing apartment houses or in new structures. Manufacture on a commercial scale will take place as soon as materials are available. This method of heating "eliminates waste of fuel caused by opening windows to cool off apartments," and tests reported by the manufacturer of the control in typical local dwellings show that average fuel savings of 20 per cent may be expected. In addition, "added tenant satisfaction, longer leases, and reduction of vacancies in buildings are factors which will cut operating costs."

Aluminum Bronze Electrode

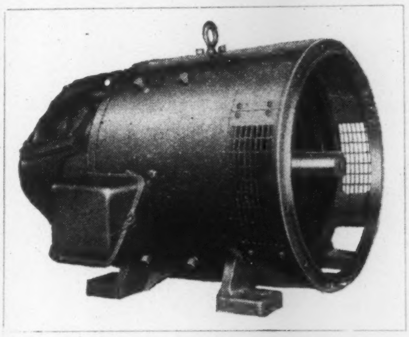
No. 2627—A new coated aluminum bronze electrode is a shielded arc electrode and can also be used as a filler rod in carbon arc welding. It will produce welding deposits of great strength and hot ductility combined with desirable resistance to corrosion, says the manufacturer. It has a most universal application in welding of bronzes, malleable and cast iron, or steel, it is stated, and also has specific applications for which it is especially suited, such as welding manganese bronze conforming to federal specifications QQ-B-726b, or Navy specifications 49-B-3e. It can also be used for welding dissimilar metals, such as cast iron to brass, steel to malleable iron, or the joining of any two metals which are weldable with aluminum bronze.—Wilson Welder and Metals Co., Inc., 60 E. 42nd St., New York, N. Y.

Turbine Pump Saves Plant Addition

No. 2628—A natural gas company planned a small repressuring system in one of their plants which called for approximately 300 gpm of water circulating through the engines and condensers for cooling. It appeared that an additional building would be necessary to accommodate the required pumping equipment and piping. However, cost of plant addition was avoided by installation of two deep well turbine pumps, as the vertical construction of the pump saved sufficient floor space so that it was not necessary to provide an additional building, according to the pump manufacturer. The water from the cooling tower comes directly through a large pipe to the suction of the pumps and the discharge goes directly through the engines and condensers and back over the cooling tower.—Deming Co., 14 Aetna St., Salem, Ohio.

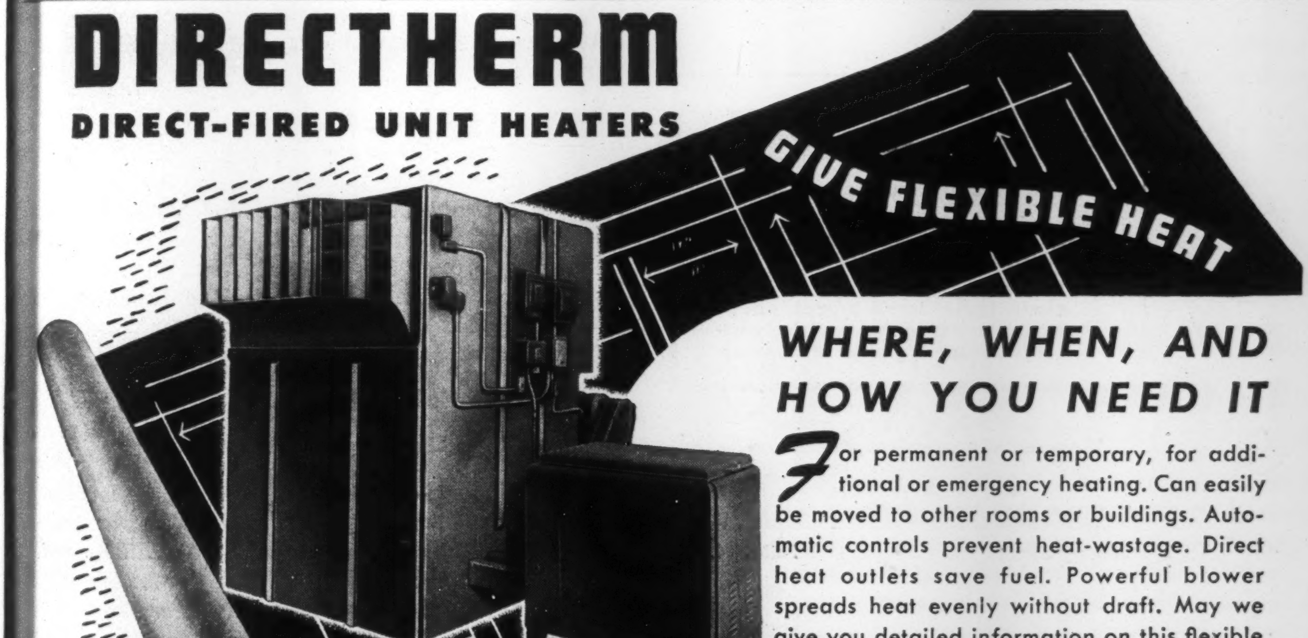
Generators for Gas Engine Drive

No. 2629—Direct current engine generators of the type illustrated are available in sizes from 1 to 200 kw for direct assembly to the engine frame or for belted drive. These generators are constructed to bolt directly to the engine housing and engine shaft. Equipped with one ball bearing, the engine end of the rotor is supported by the engine bearing. Built for voltages ranging from 15 to 600 for a wide variety of applications.—Century Electric Co., 1806 Pine St., St. Louis, Mo.



Timer for Remote Control

No. 2630—A new multi-contact timer for remote control is used to govern a series of machine operations in definite order, to automatically reverse or alternate in operation a group of motors or machines, to operate in a predetermined sequence a series of signals, valves or solenoids, as well as for numerous other applications where sequence operations are of prime importance. Its solenoid starting mechanism is operated from a remote control momentary start button, so that the timer will go through its complete cycle or any part of the cycle. Reclosing the start button will either continue or repeat the cycle, as the case may be.—R. W. Cramer Co., Inc., Centerbrook, Conn.



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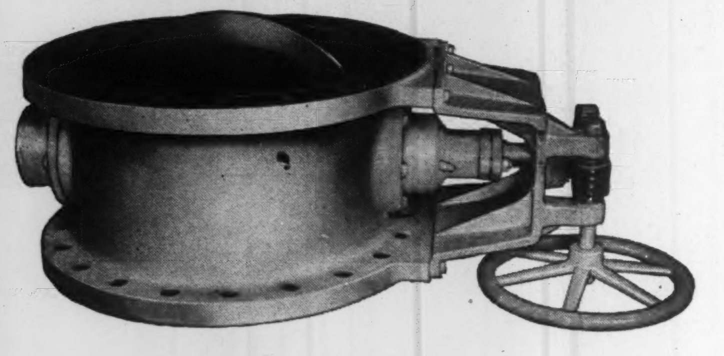
150-pound steel valve with raised face. Hand wheel operated. Extra rugged construction.



R-S Cast Steel Butterfly Valves are divided into two classes. Class A are lightweight, close coupled 15-pound valves with series 15 flanges. For limited pressure drops, ball bearings can be used. Class B are constructed for heavy duty service. The face-to-face dimension is greater than that of Class A valves, permitting the installation of oversized shafts, bearings, stuffing boxes, etc. for higher working pressures and temperatures.

In ordering any R-S Butterfly Valve, regardless of type, class or service for which it is to be used, it is essential to furnish the following information:

1. Size of valve and type of flanges.
2. Nature of gas, liquid or other material to be shut-off or controlled.
3. Line pressure and pressure loss in valve.
4. Rate of flow and operating temperature.
5. Method of control (hand lever, chain lever, hand wheel, chain wheel, extended shaft for inaccessible locations or power operation).

No. 610
Heavy-duty air motor operated steel valve equipped with hand jack, mercury switch, hand wheel declutching unit and dual stuffing box.

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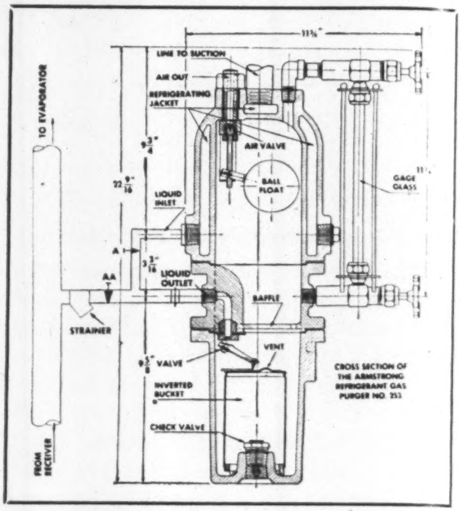
R-S *Streamlined* BUTTERFLY VALVES

Purger for Refrigerating Systems

No. 2631—In order to overcome wear on valve seats when refrigerant purgers are subject to a continual operation—such as occurs in refriger



CROSS SECTION OF THE ARMSTRONG REFRIGERANT GAS PURGER NO. 253

systems when suction pressures are below atmosp all or part of the time, causing infiltration of a new purger has been developed. The valve controll the inverted bucket discharges liquid refrigerant t liquid supply line instead of directly to the refrig ing jacket. Thus, instead of a pressure differential where from 100 to 200 psi, the differential across valve is only 1 or 2 psi, which is said to keep wea the valve and seat at a minimum. This model does replace previous ones but is especially recommende the maker for systems with low suction pressur Armstrong Machine Works, 874 Maple St., Three ers, Mich.

Pump for Oil Sludge

No. 2632—New 300 gpm pumping unit powered 25 hp diesel engine is designed for handling oil sl and is fitted with steam jacketed heads to lower viscosity of the pumpage. The engine speed is 1200 reducing through a double reduction, oil immersed to 300 rpm on the pump shaft. The discharge pres of the pump is 25 psi.—Blackmer Pump Co., 1920A tury Ave., S.W., Grand Rapids 9, Mich.

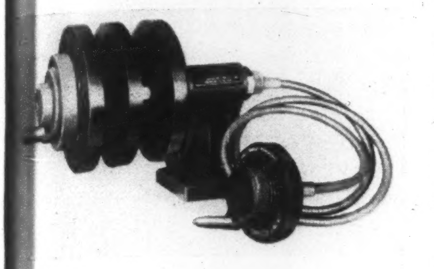
Adjustable Hole Cutters

No. 2633**—A set of three adjustable hole cu that cut all possible diameters from ⅝ to 3½ in. was cently announced. They may be used as hand tool electric drills, portable air motors, or in light presses and lathes, and cut holes in stainless steel, iron, brass, fibreboard, plastics, "problem" mater and in pipe, tubing, or other curved surfaces, says manufacturer. Cutters consist of a straight shank

BUY
WAR BONDS

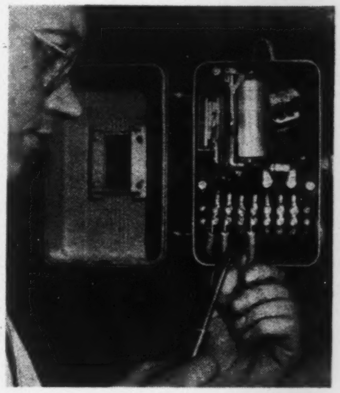
a hexagon body into which are set three high speed steel blades at 120 deg intervals. According to the manufacturer, the blades are easy to set, requiring only a steel rule for measuring the distance from the pilot to the edge of each blade. Other hole cutters are available in various sizes for diameters up to 10 in. and thickness capacities up to 2 in.—Robert H. Clark Co., 9330 Santa Monica Blvd., Beverly Hills, Calif.

Variable Speed Transmission



No. 2634—Featuring a simplified remote control and universal mounting, a new variable speed transmission for drives up to 1 hp, known as the "Speed-Jack," has been developed. Remote control is made easy through a compact flexible shaft which makes it possible to mount the unit anywhere in or on the machine and to place the control in a safe and handy location, says the manufacturer. The movement of the flanges is controlled mechanically and thus the unit may be mounted vertically, horizontally, or in any other position. V belts are utilized to provide stepless control of speed through a three to one ratio. Plastic flanges, steel faced, contribute to the light weight of the device.—American Pulley Co., 4200 Wissahickon Ave., Philadelphia 29, Pa.

Electronic Relay



No. 2635—A new electronic relay for amplifying current transmitted by delicate control contacts or high resistance circuits is especially suitable for controlling liquid levels in tanks and boilers, as a limit switch, for sorting metallic parts by size, detecting broken threads in textile machines, etc., says the manufacturer. In operation the electromagnetic relay in the device is kept energized as long as the controls connected to the input grid circuit of the electronic tube remain open. The instant these contacts close, the relay is de-energized. A built-in time delay feature prevents chattering when the contacts in the input circuit are momentarily closed.—General Electric Co., 1 River Rd., Schenectady, N. Y.

Cleaning Method for Goggles and Lenses

No. 2636—A method for cleaning goggles, glass faced dials, microscope and inspection lenses, etc., in industrial plants, comprises hermetically sealed ampoules of cleaning concentrate each of which when mixed with distilled water makes a full gallon of cleaner, and cleaning station dispensers. The concentrate

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Where extremely accurate pressure regulation of steam, oils, liquids, gas or air is of prime importance, the K & M Diaphragm Motor Valve is the prime choice. Designed especially for use with air-operated instruments or auxiliary pilot units, this precision valve can be furnished with various types of inner valves—to meet exactly your different conditions of flow and pressure. Its patented special features assure minimum friction-lag and maximum efficiency. Furnished in sizes ½" to 12", pressure to open or close, or single-seated for positive shut-off. It also is available with finned bonnet for very high or very low temperatures. Submit your problems to our Engineering Department for specific recommendation.

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is a specially compounded detergent which removes f grease, grime and splatter, and leaves no halation, sa the manufacturer. The dispensers are of the pressu type, charged with air, either from any standard psi air line or with a small hand pump. At the tou of a lever they release the cleaner in a fine mist.—Bri Ize Co., 1218 Pratt Blvd., Chicago 26, Ill.

Purchases Motor Concern

No. 2637—Purchase of the Electric Machinery M Co., Minneapolis, Minn., by Worthington Pump & M chinery Corp., Harrison, N. J., was announced la month by the presidents of the two concerns. The se ond important acquisition by Worthington within year, Electric Machinery's lines of synchronous mot for direct drive for a wide variety of power plant a industrial machinery, as well as other equipment, pr vide a large extension of Worthington's already lar power and industrial equipment lines. The other rece Worthington acquisition took place in July 1943 wh Ransome Machinery Co., Dunellen, N. J. became wholly-owned subsidiary.

Heating Control System

No. 2638—Formation of a new division to manufa ture and market its recently announced "Moduflo heating control system was announced last month the Minneapolis-Honeywell Regulator Co., 2701 Four Ave., S., Minneapolis 8, Minn. Harry C. Jenkins ha been promoted to managership of the newly create post, while a nucleus of a sales organization has be started by the addition of three specialists to the sta They are John E. Peterson, Milford G. Bird, and Bru F. McLouth.

Detachable Coupling for Flexible Metal Hose

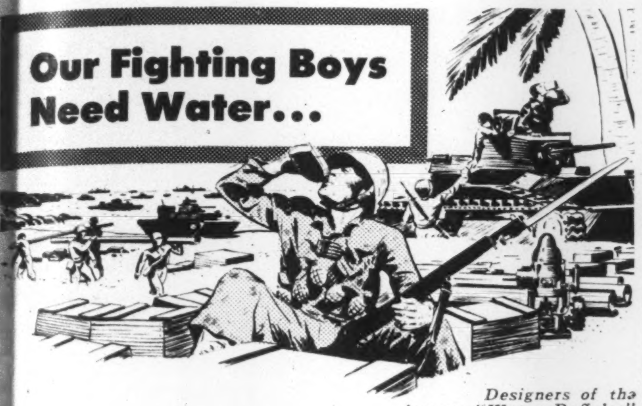
No. 2639—A detachable brass coupling for helical fle ible metal hose in sizes from ¾ to 1½ in. ID offers th advantage of being mechanically self-sealing. The un consists of four parts—the nut, back, stem, and spl ring. When assembled the convolutions of hose and th metal braid are held by pressure between the members The coupling has withstood pressure tests up to 800 l The feature of the design is a self-contained unio which permits the pipe thread end of the coupling to b screwed directly into the machine fitting and the unio tightened without twisting the hose.—Packless Meta Products Corp., 31 Winthrop Ave., New Rochelle, N.

Metallic Arc Welding Aluminum

No. 2640—An electrode with a new coating which ca be used in the welding of aluminum sheet and castings is said by the manufacturer to open a new field for ar welding in the salvage and reclamation of aluminum castings. It is possible with this electrode to add meta without completely preheating the casting and partic ularly without danger of overheating the metal adja cent to the weld. Another field where the electrode is said to simplify and speed up work is in the joining of aluminum sheet, as the "high rate of fusion of the rod produces a smooth, strong, homogenous fillet, with grea speed, avoiding distortion and stresses."—Eutecti Welding Alloys Co., 40 Worth St., New York 13, N. Y.

Food Conditioner

No. 2641—A new cooling unit, known as the "Am coil" food conditioner, combines controlled high humid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IT TAKES a lot of things, like bullets, bombs, bayonets, bazookas—and *water,* to win a war. Cool, fresh drinkable water in abundance. Peerless Pumps at the fighting fronts keep canteens filled—and keep our fighting men fit!

Ever since Pearl Harbor, the building of *Peerless Pumps,* like the building of the justly famous "Water-Buffalo" Amphibian Tanks (also Peerless designed), has been an essential *War Industry.*

Even in the days before the war, Peerless was producing more Deep Well Turbine Pumps than any other concern in America. As the leading manufacturer in the Industry, Peerless won recognition throughout the entire civilized world. On the great ranches, farms, orchards and irrigation projects. In the waterworks of our great cities. In the vast industrial plants. Wherever water is needed, there you find dependable Peerless Pumps, operating twenty-four hours per day, year in and year out.

Now that we are meeting the tremendous war-front demand for Pumps, we hope to be able to start "digging in" on our huge backlog of orders for home needs.

PEERLESS PUMP DIVISION — Food Machinery Corporation
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1 to 6 gal. per hour

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general application type
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both steel and C. I. sectional boilers; forced warm air units; and instantaneous water heaters.

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Manual - Semi Auto - and Automatic* for either un-heated or pre-heated industrial oils, up to 145 g.p.h. Built-in motor or belt drive.

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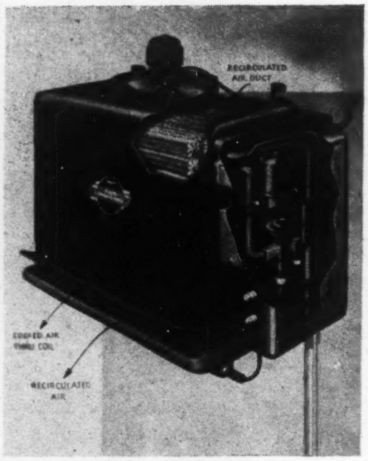
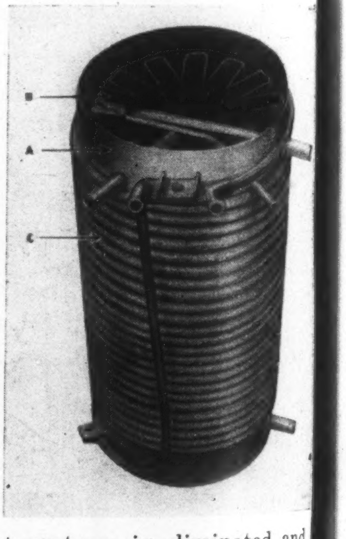
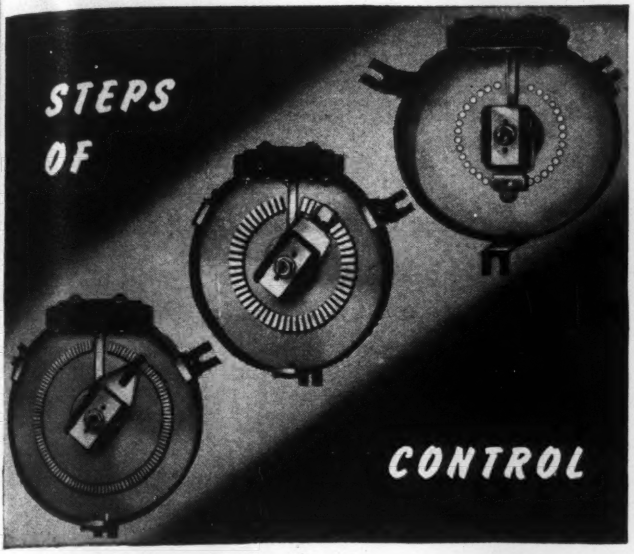


ities with cooled air in order to preserve foods by eliminating dehydration. The manufacturer is now able to offer these units "for replacement equipment on orders with a priority rating of AA5 or better under L38." This refrigeration system is of the wall mounted, one man hanger type, designed for use in walkin boxes. Temperatures are automatically controlled down to 35 F and relative humidities up to 93 per cent. Air is drawn into the top of the casing by the fan and is directed downward. The casing is partitioned into two parts, the major portion being occupied by an evaporator coil. The main stream of air is directed through this coil and the partition directly behind the coil provides a vertical passage through which the balance of the air stream is directed over water collected in the drain pan recess. An immersion heater in the drain pan recess is energized by a humidistat when humidity is required, resulting in moisture vapor rising and mixing with the recirculated air. The cooled air and the moisture laden recirculated air then join and are directed into the refrigerator space by an air control deflector. All parts and controls are furnished complete.—American Coils, Inc., 25-27 Lexington St., Newark, N. J.

Water Coolers



No. 2642—The recently announced "Strata-Flo" water coolers are designed to eliminate warm up and "wet" systems (water in refrigerant lines), and feature a simplified method of control, according to the manufacturer. New in design, the shell of the storage tank *A* is between vertical interior fins *B*, and external refrigerant coil *C*. Continuous cooling action on the entire body of water in the storage tank is transmitted from the refrigerant coil through the shell to these fins. Since the refrigerant can never come in direct contact with water, danger of wet systems is eliminated and control is noncritical, it is stated. This permits use of the simplest types of controls consisting of an automatic expansion valve and external adjustable thermostatic switch. Both cabinet and tank models are available in 3½, 7, and 12½ gal capacities.—Drayer & Hanson, Inc., 738 E. Pico Blvd., Los Angeles 21, Calif.



Wide selection in the number of steps of control is provided in Ward Leonard Plate Type Rheostats. This often saves going to multi-plate assemblies. Ward Leonard Plate Type Rheostats are made in six sizes: 4″, 6″, 8″, 13″, 15½″, and 18″ . . . single and multi-plate . . . front and back-of-board mounting . . . manual and motor driven. You can get exactly the rheostat your job requires from Ward Leonard.

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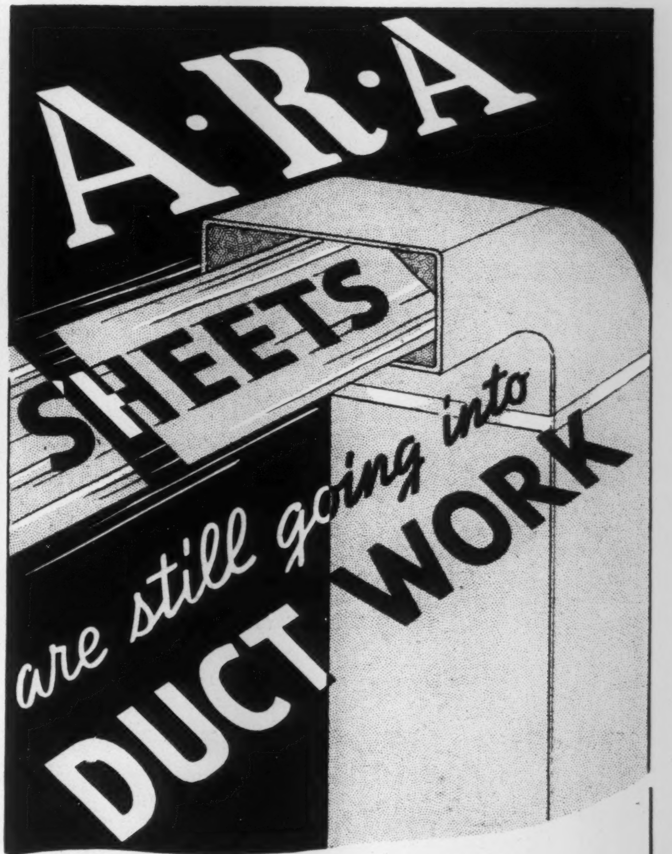

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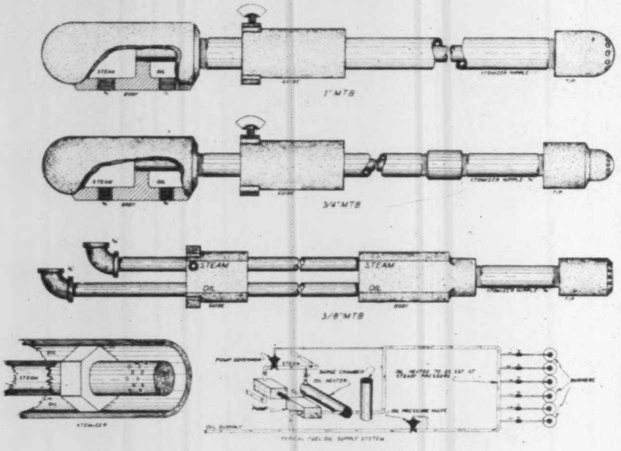


JOHN ZINK
Series MTB OIL BURNER

- Delivers more heat with less flame at less excess air.
- Impartial tests proved superior operation in connection with automatic controls.
- Steam consumption for atomization runs less than 1.25 lbs. of steam per gallon of fuel oil burned.
- They take the drudgery out of firing with oil.
- Designed to provide typical John Zink simplicity and accessibility.

●

"JOHN ZINK
Products Must Be Good"

Write for Details Now!

John Zink Co.
TULSA 1, OKLAHOMA

New York ● St. Louis ● Detroit ● San Francisco

NEW BOOKS & REPORTS

Oxyacetylene Handbook

The Oxyacetylene Handbook comprises a complete, comprehensive, and authoritative text on basic oxyacetylene welding and cutting procedures. It is intended as a guide for self-instruction and also as a standard classroom textbook in vocational and trade schools, technical high schools, and engineering colleges. Considerable space is devoted to explaining operating principles and giving instructions for care and maintenance. Among the subjects covered are how to set up, operate, and care for oxyacetylene apparatus; what flame adjustment to use and how to use it; how to identify metals; how to weld steel, cast iron, malleable iron, galvanized iron; how to weld aluminum, copper, brass, bronze, nickel, monel, lead, magnesium; how to bronze weld; how to do heating, bronze surfacing, hard facing, flame hardening, silver brazing; how to cut steel, cast iron, stainless steel; how to test welds; how to develop welding procedure controls; how to organize and lay out a welding shop. Price of this 600 page manual is $1.50, and the publisher is the Linde Air Products Co., 30 E. 42nd St., New York 17, N. Y.

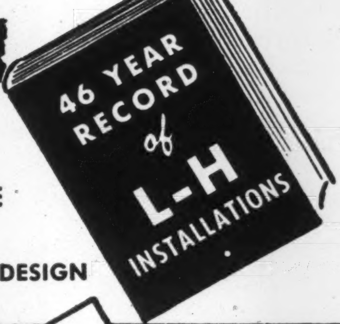
Control of Electric Motors

In the second edition of Control of Electric Motors, by P. B. Harwood, manager of engineering, Cutler-Hammer, Inc., there have been added new chapters on synchronous motor control and variable voltage control, many new tables giving ratings of motors and controllers have been included, and the text and illustrations throughout have been revised to conform to latest practice. This very practical and well organized book has chapters on direct current contactors and relays, alternating current contactors and relays, pilot devices and accessories, accelerating methods, wiring diagrams, construction of control apparatus, magnetically operated brakes, the direct current shunt motor, shunt field relays and rheostats, variable voltage controllers, the direct current series motor, two motor drives, dynamic lowering hoist controllers, the polyphase squirrel cage motor, the wound rotor motor, single phase motors, the synchronous motor, resistor design, and electronic motor control. It is published by John Wiley & Sons, Inc., 440 Fourth Ave., New York, N. Y., contains over 475 pages 5¼ x 8¼ in. in size, and the price is $5.00.

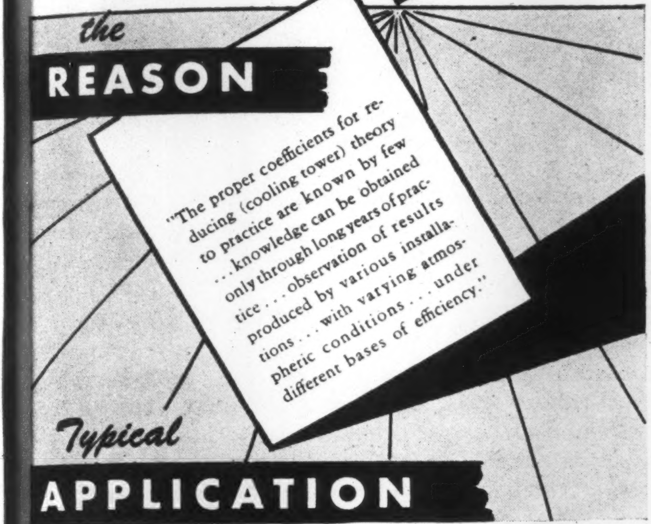
Application of Overfire Jets

Bituminous Coal Research, Inc., 803 Southern Bldg., Washington, D. C., issued recently a 14 page technical report No. VII on Application of Overfire Jets, by Richard B. Engdahl, research engineer, Battelle Memorial Institute. Application of jets for elimination of smoke and reduction of fuel waste is discussed, and information is given on construction of jets, how to select the proper size, changing the amount of air, location of jets, silencing jets, etc. It is pointed out that jets are not a cure-all for smoke caused by extremely poor firing practice or equipment. It is pointed out also that if jets must be installed for abating smoke, they should be operated only as needed.

the **SOURCE** *of* **PRE-TESTED PERFORMANCE** *in* **COOLING TOWER DESIGN**

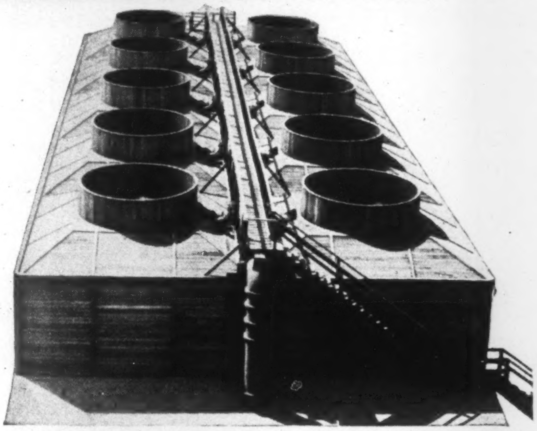


the **REASON**



"The proper coefficients for reducing (cooling tower) theory to practice are known by few ... knowledge can be obtained only through long years of practice ... observation of results produced by various installations ... with varying atmospheric conditions ... under different bases of efficiency."

Typical **APPLICATION**



Installed for War Department at large government arsenal for condenser water cooling.

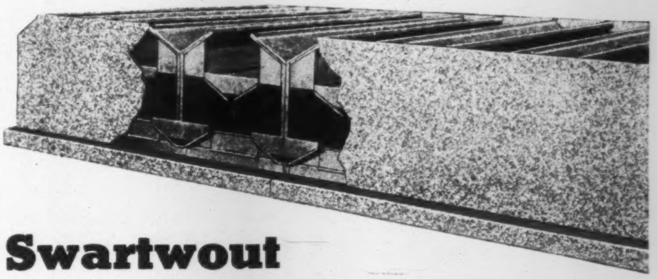
Type: 10-cell Induced Draft Tower, back-to-back construction.

Construction Features: Independent operation of individual, or cell groups. Motors located out of air stream. Redwood discharge stacks prevent recirculation.

Capacity: 13000 GPM . . . 20 degree range.

NOTE: No leaks in tower casing . . . watertight wall construction. Photographed after 14 months operation.

LH
Lilie-Hoffmann
COOLING TOWERS, INC.
Manufacturers of All Types of Water Cooling Towers
GENERAL OFFICE: 4239 DUNCAN AVENUE, ST. LOUIS, MO.
PLANTS AT ST. LOUIS, MISSOURI AND PLAINVIEW, TEXAS



Swartwout

AIRMOVER—

An effective industrial ventilating system that assures positive results

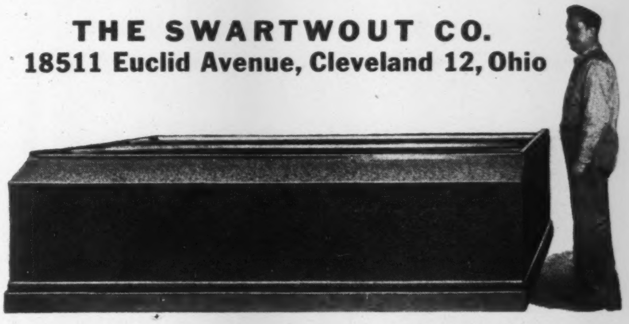
Even under the most difficult industrial building conditions

Used most successfully on forge shop, heat treatment buildings and other manufacturing buildings where "tough" smoke and heat conditions prevail.

Enormous quantities of heat, smoke and fumes are *moved* rapidly through the efficient AIRMOVER. Comfortable working conditions are provided in all areas. AIRMOVER spreads out over heat-laden sections or entire buildings—provides ready escape, *assisted by harnessed natural principles,* for the surging volumes of unwanted atmosphere.

Large steel mills, forge shops and foundries are finding Swartwout AIRMOVER not only a "production-speeder" but extremely economical as well. Ask for the facts.

THE SWARTWOUT CO.
18511 Euclid Avenue, Cleveland 12, Ohio



AIRMOVER *is only 32" high—can be custom built for special requirements.*

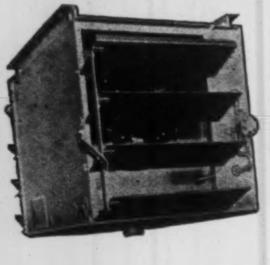
LIKE
OPENING
YOUR ROOFS
TO THE SKY

Swartwout

Specialists in Air Movement
by *Natural* Methods

KRAMER
LOW TEMPERATURE
Unit Coolers

FREEZING OVEN
Electrical Defrost



for LOW
TEMPERATURES
(below 32°)

THE FREEZING OVEN is a low temperature unit cooler with a self-contained electrical defrost mechanism. The complete unit is housed in an insulated shell with insulated front and rear adjustable louvers.

SPECIFICATIONS: All copper KRAMER coil, ⅝" tube, ½" fin spacing, fin sweated to tube. An electrical heater of suitable wattage, suction line hand valve mounted on shell shunted by a relief valve. Insulated steel housing, insulated adjustable front and rear louvers, specially designed silent fan driven by totally enclosed fan duty motor of proper capacity designed for continuous operation.

FREEZING SHOWER
Water Defrost

MATE TO
THE
FREEZING
OVEN

THE KRAMER FREEZING SHOWER offers a low temperature unit using a water shower of ordinary tap water to defrost. It can be completely defrosted in a few minutes without effecting the temperature of the box, simple to install and operate.

Send for descriptive Folders on the KRAMER FREEZING OVEN and the KRAMER FREEZING SHOWER.

KRAMER TRENTON CO.
Trenton, New Jersey

Many Opportunities to Reduce Fuel Usage

Coal normally is so abundant and so cheap in the United States that, with the exception of certain of the larger industrial users, such as electric power plants and railroads, few consumers give much thought to saving fuel.

We waste huge quantities in various ways, many of us unconsciously. We fail to keep our heating equipment in clean, efficient working condition, or lack the knack of firing the furnace and regulating the damper so as to utilize the potential heat in our coal to the fullest extent possible. We pour on unnecessary coal, allow heat to escape wastefully up the chimney, overheat the building, then open a window or a door to cool it down.

A great many people do not take all of the precautions that they could to keep the heat inside. They let it escape outside for lack of weatherstripping, storm sashes, or insulation; by carelessly leaving doors and windows open; or by improvident firing. Many of us waste coal in other ways. We burn unnecessary electric lights without reflecting that it requires coal—huge quantities of it— to keep our lights bright. Most of us use more hot water than we really need.

As an example of needless waste, a survey made in Nashville in 1942, embracing 134 industrial and commercial users, showed that 83 per cent of the boiler and furnace units were in bad order and were not burning coal efficiently. The engineers who made the survey believed that better boiler room supervision in most instances could save from 10 to 25 per cent of the coal bill.

I have not singled out Nashville because conditions there are worse than those of any place. In fact, they are probably typical of most American cities. The Bureau of Mines reports that a survey in Indianapolis revealed similar conditions. I have been told that an investigation by the smoke abatement bureau at Atlanta some time ago disclosed that more than 50 per cent of the plants inspected were seriously in need of repairs or reconditioning before they could be operated efficiently. Of 12,116 small heating plants inspected by one large company last year, only 5 per cent were reported to be in a satisfactory condition.

We know from actual experience that practical efforts will result in the saving of a substantial amount of coal, both by the domestic user and by most industrial and commercial consumers. For instance, the Bureau of Mines during recent months carried out experiments for saving coal in certain United States government heating plants. The results achieved were highly illuminating. A saving of 11.9 per cent of the coal being used at the Capitol power plant was effected. A saving of 15.7 per cent was accomplished at Walter Reed hospital. The Post Office equipment shop was able to save 20 per cent, and so on down the list.

Bureau of Mines engineers say that these plants, in general, had been operated more efficiently than the ordinary small industrial plant, and that the improvements that they suggested for saving coal were confined to the boiler rooms. They did not include methods of saving coal by using more efficiently the steam produced.—From a talk by Robert F. Duemler, of the Solid Fuels Administration for War.

There is No Substitute

FOR THE DEPENDABILITY OF

HUSSEY COPPER

in Post War Planning

- ★ UNIFORMITY
- ★ WORKABILITY
- ★ CORROSION RESISTANCE
- ★ RUST-FREE FOREVER
- ★ NEW, WAR-PROVED ALLOYS

***The* PATRIOTIC AMERICAN WAY—**

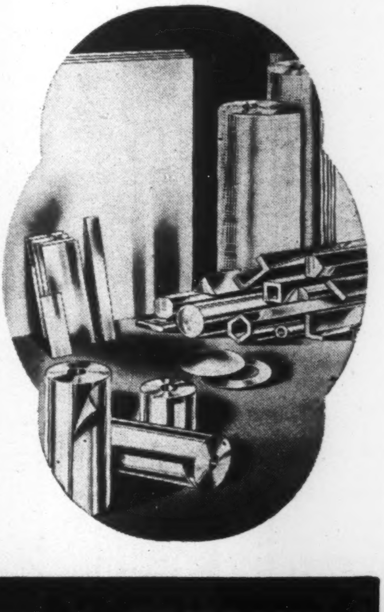
DO THE BASIC PLANNING

Now!

Hussey engineers with their background of research, their metallurgical, creative resources and new wartime "KNOW-HOW", are working with leading manufacturers in virtually every industry—helping to plan the thousand-and-one post war uses for copper and its alloys . . . to better provide the promised jobs to our fighting men after Victory.

Planning for the future yes, without a moment's let-up in production effort because America still needs all the copper we can produce—for speedy Victory.

Hussey engineers are ready to aid you —in Basic Planning NOW!



C. G. HUSSEY & COMPANY

(Division of Copper Range Co.)

Rolling Mills and General Offices: PITTSBURGH, PA.

Warehouses in Principal Cities

It's to YOUR Advantage to use

Wagner

Air-Cooled

TRANSFORMERS

Because they are—

Safe for either indoor or outdoor installation.

Compact and easy to install.

Usable right at load.

STUDY THESE FEATURES:

1. Dry-type . . . no liquid.

2. Core and coils are vacuum treated in compound for protection against moisture.

3. Totally enclosed.

4. Provided with built-in junction box with knockouts on sides and bottom for conduit or open wiring.

5. Large removable coverplate of junction box assures ease in making connections.

6. Hanger-lugs designed for ease in mounting.

7. All ratings within the limits of the National Board of Fire Underwriters have the Underwriters' approval.

MOTORS
TRANSFORMERS
UNIT SUBSTATIONS
INDUSTRIAL BRAKES
BRAKE LINING

T44-10A

***Write* FOR COMPLETE LITERATURE**

Wagner Electric Corporation

ESTABLISHED 1891

6370 Plymouth Avenue, St. Louis 14, Mo., U. S. A.

ELECTRICAL AND AUTOMOTIVE PRODUCTS

INSTALLING OIL BURNING EQUIPMENT

Readers have requested information regarding the procedure to be followed by industrial plants or buildings for the installation of new oil burning equipment and for the use of fuel oil.

According to petroleum distribution order No. 13, issued by the Petroleum Administration for War, as amended October 13, 1943, paragraph (b) (2) prohibits the transfer of fuel oil for use in new industrial oil burning facilities unless (1) the facilities were specified in a construction contract if installed in a new structure and (2) the foundations under the main part of the structure were completed prior to July 31, 1942, or prior to July 22, 1943, depending upon the area in which the premises to be heated are located.

In addition, paragraphs (d) and (e) of this order provide the method for filing an appeal for an exception in all cases where compliance with the terms of the order would work an exceptional and unreasonable hardship. Each application received is considered upon the merits presented and each appeal is given individual attention. If the appeal warrants an exception to the terms of the order, a letter of authorization for the transfer of fuel oil in the new facilities is mailed to the applicant.

To acquire new facilities for use in industrial plants or buildings a person is required to secure a preference rating for such equipment. This preference rating is obtained under War Production Board limitation order L-74. Paragraph (d) (1) of this order provides that any application for such preference rating must be accompanied by a copy of authorization from the Petroleum Administration for War, permitting the transfer of fuel oil for use in such new facilities. Therefore, such authorization is a prerequisite to the issuance by the War Production Board of a preference rating for the delivery of such new facilities.

COPPER AND BRASS GROUP OPTIMISTIC

Robert L. Coe, vice-president of Chase Brass & Copper Co., was reelected president of the Copper & Brass Research Association at its 24th annual meeting held last month. Other officers elected were: Vice-presidents; Wylie Brown, president of Phelps Dodge Copper Products Corp.; William M. Goss, vice-president of Scovill Mfg. Co.; Curtis L. Smith, treasurer of the National Copper & Smelting Co.; Herman W. Steinkraus, president of the Bridgeport Brass Co.; treasurer, C. Donald Dallas, president of Revere Copper and Brass; manager, T. E. Veltfort; and secretary, B. B. Caddle.

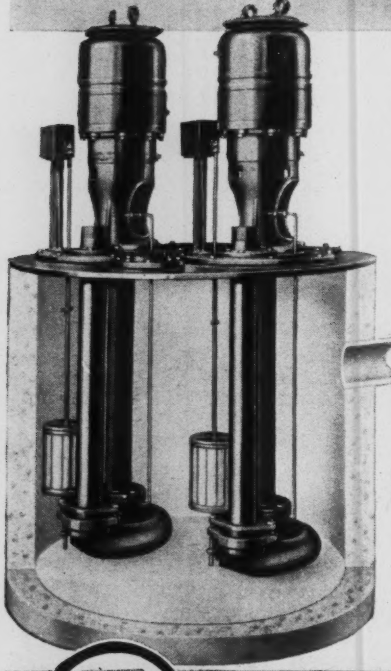
Copper and its alloys have been utilized 100 per cent in the manufacture of war armament and other essential requirements, and representatives of the 42 member companies were quite optimistic about post war uses.

* * *

The Frank P. Brown medal, awarded annually by the Franklin Institute, has been presented to Dr. Harvey C. Rentschler, director of research, Westinghouse Lamp Div., for his work in development and application of an ultraviolet lamp that kills bacteria.

This NON-CLOG SEWAGE EJECTOR

...DOES AWAY WITH SCREENING AND CLEANING!



Here, again, Economy design improves pump performance and *cuts maintenance costs* by eliminating need for strainers, and disagreeable job of cleaning them.

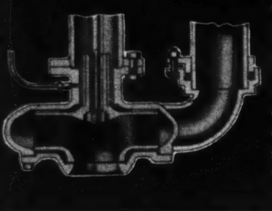
The wide Economy impeller has smooth, clear passages that allow solids and rags to pass without danger of catching or clogging, an important advantage in the handling of domestic or industrial sewage, solids or pulpy materials. Economy Sump Pumps are able to *sustain* high rated efficiency with minimum attention, by virtue of these additional engineered features:

- **Heavy duty patented shock absorber immediately above runner.**
- **Oversize bearing surface above impeller at point of greatest strain and wear.**
- **Replaceable ground steel sleeve eliminates wear on shaft.**
- **All joints accurately registered to insure perfect alignment.**
- **Capacities from 50 to 4000 G.P.M. with heads up to 120 feet.**

These and many other Economy advantages are fully described in free literature. Economy's Engineering Service will gladly help you to select correct pumping equipment.

Special ECONOMY *design features*

High pressure grease feed to all bearings with single gun. Impeller adjusting nuts encased in flexible coupling, protected against accident or tampering.

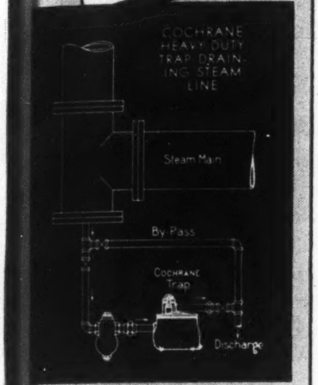


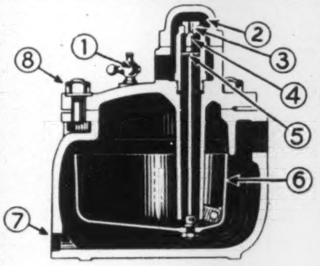
Note wide "Non-Clog" impeller and patented shock absorber which cuts down objectionable overhang, eliminates whip and provides oversize bearing surface.

ECONOMY PUMPS, INC.

HAMILTON, OHIO, U. S. A.

COCHRANE *Drainage* EQUIPMENT


COCHRANE HEAVY DUTY TRAP DRAINING STEAM LINE
Steam Main
By-Pass
Cochrane Trap
Discharge

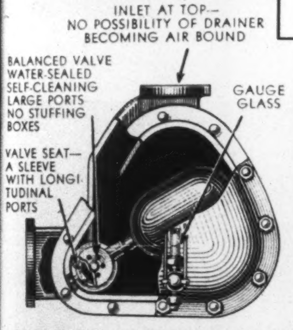


COCHRANE HEAVY-DUTY STEAM TRAP

1. Air removal vent cock
2. Removable valve bonnet
3. Easilychanged valve seat
4. Stainless steel valve
5. 4 centering arms
6. Large displacement bucket
7. Opening for drain or blow-off
8. Bolts for easy accessibility

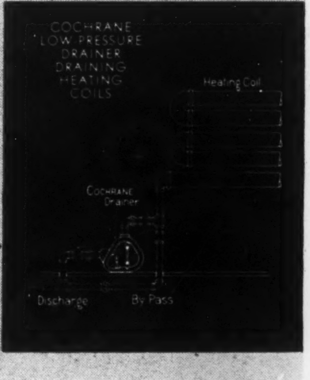
ADVANTAGES

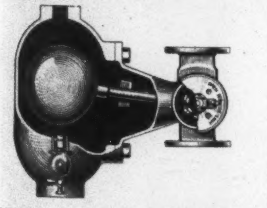
Only eight parts. Large cast-iron bucket holds valve tightly to seat until water overflows rim, opening valve wide. No levers, restricted passages or stuffing boxes to become clogged. Seat easily changed for various discharge rates. Write for Publication 2850.


INLET AT TOP—NO POSSIBILITY OF DRAINER BECOMING AIR BOUND
BALANCED VALVE WATER-SEALED SELF-CLEANING LARGE PORTS NO STUFFING BOXES
GAUGE GLASS
VALVE SEAT—A SLEEVE WITH LONGITUDINAL PORTS

COCHRANE MULTIPORT DRAINER

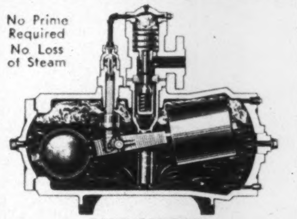
A low pressure drainer especially suited for operation at low differential pressures because of its very large port areas which provide a tremendously large discharge capacity. It uses a rotating cylindrical valve, directly attached to the float stem. Publication 2925 gives details.


COCHRANE LOW-PRESSURE DRAINER DRAINING HEATING COILS
Heating Coil
Cochrane Drainer
Discharge
By Pass



MULTIPORT DRAIN REGULATOR

Discharge regulated by height of condensate in body. Exceptionally large capacity.


No Prime Required
No Loss of Steam

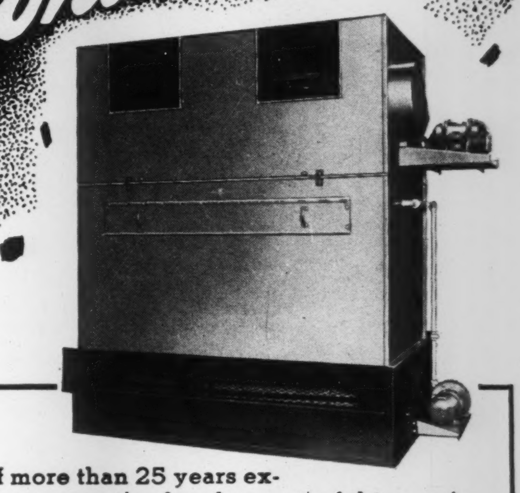
DISCHARGER

For removing large quantities of condensate under high pressure (150 to 2000 lb./sq. in. or higher).

COCHRANE CORPORATION • 3131 N. 17th ST., PHILA., PA.

COCHRANE

Evaporative Condensers



Out of more than 25 years experience comes the development of this year's models of Acme Evaporative Condensers.

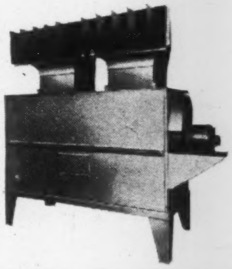
Wherever water supply presents a problem they furnish the most efficient and economical solution. For Acme has found a way to provide plenty of cooling surface without the use of fins and conserve valuable space.

Cooling coils are all prime surface and especially designed for evaporative condensers.

Definitely they're more efficient. A wide range of capacities. Write for catalog No. 27.

☆ ☆ ☆

BLO-COLD FORCED AIR COOLERS



● Floor type units for high or low temperature requirements wherever forced air cooling is advisable. Dry fin coil type and brine spray models—a unit for any job. Our engineers are at your service if they can be of help to you. For complete recommendations, write for Catalog No. 32.

ACME PRODUCTS

ACME PRODUCTS

Evaporative Condensers
Ammonia Condensers
Freon Condensers
Dry-Ex Water Coolers
Flooded Water Coolers
Hi-Peak Water Coolers

Forced Convection Units
Pipe Coils
Heat Interchangers
Oil Separators
Liquid Receivers
Heat Exchangers

Write for Catalog on any item.

ACME INDUSTRIES
JACKSON, MICHIGAN

• WPB . . . OPA . . . PAW . . . Etc. •

BUILDING AND CONSTRUCTION

Success in cutting back construction projects for 1944 to a larger degree than had been anticipated, was reported last month by the War Production Board. Total volume of construction this year is not expected to exceed $3.5 billion, as contrasted with the $3.9 billion estimate made last fall, says the WPB.

The total volume of construction activity in the U. S. in the first quarter was under $900 million, which is less than 40 per cent of the volume of construction put in place in the corresponding quarter of 1943. The March rate is expected to be slightly exceeded in the second and third quarters as seasonal increases will more than make up for declines in military and war plant expansion.

The revised WPB estimates for 1944, based on the assumption that present policies affecting construction will remain in force and that total war will continue through 1944, indicate a volume of construction in the United States of $3,500,000,000 or 46 per cent of the 1943 and 26 per cent of the 1942 volume. Declining activity is anticipated in all types of construction with the sharpest drop occurring in non-industrial military construction which is expected to decline to about $770,000,000 or 29 per cent of the 1943 work and 15 per cent of the 1942 total in this category. Government-financed industrial construction is expected to be 30 per cent of the 1943 volume of activity, with machinery and equipment deliveries down to an estimated 35 per cent of the 1943 volume. Housing, privately-financed industrial work, and other types of construction are expected to show more moderate declines.

EASING OF BUILDING RESTRICTIONS DENIED: A report that WPB soon will issue priorities and release building materials for partial resumption of normal private housing construction was denied by WPB and NHA last month. Construction is still limited to war housing program.

OCR TO HELP REHABILITATE BUILDINGS RELEASED BY SERVICES: Establishment of procedure under which Office of Civilian Requirements may give special assistance in rehabilitation of hotels, apartment houses, and office buildings released by War and Navy Departments for private civilian operation was announced last month by WPB.

COAL

ANTHRACITE: Effective June 1, retail dealers outside the New England and middle Atlantic states are forbidden to deliver anthracite or eastern coke to consumers whose equipment "reasonably permits the use of high volatile bituminous coal," under amendments to government regulations announced May 23 by Solid Fuels Administrator Harold L. Ickes. Anthracite coal which is sold for industrial processes, power production, or space heating incidental to those uses, cannot be furnished by dealers in quantities greater than the consumer's requirements for 90 days from time of delivery, less inventory. Previously, such deliveries were limited to annual requirements, less inventory.

It takes the Niagara DUO-PASS to ASSURE the Advantages of evaporative condensing!

● Users of the Niagara AERO EVAPORATIVE CONDENSER have saved up to 35% of power while increasing useful refrigerator capacity obtained without increasing compressor equipment. This has been achieved by reducing compressor head pressure.

Only the Niagara DUO-PASS Aero Condenser assures these gains because only the Niagara Condenser has the patented DUO-PASS which lowers temperatures so that no deposit of salts or scale is precipitated on the condenser tubes. This improvement secures the full capacity of the evaporative condenser throughout its long life.

The Niagara DUO-PASS AERO CONDENSER also saves the user the cost of 95% of his condensing water and the installation expense of water-handling equipment. For complete information and records of users' savings, write to

NIAGARA BLOWER COMPANY
"25 Years of Service in Air Engineering"
NEW YORK ADDRESS: Dept. HP-64
6 E. 45th Street, New York-17, N. Y.
Field Engineering Offices in Principal Cities

NIAGARA DUO-PASS
NIAGARA

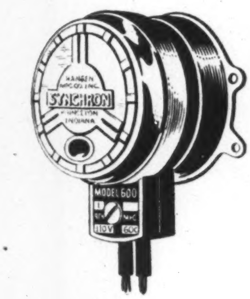
PATENTED

NIAGARA INDUSTRIAL COOLING • HEATING • DRYING
HUMIDIFYING • AIR ENGINEERING EQUIPMENT

— SMALL: 2¾" x 1-5/16" —

SYNCHRONOUS, SELF-STARTING

PULLS 8 OZ. DIRECT LOAD, 1 RPM



SYNCHRON

TIMING MOTORS and TIME MACHINES for

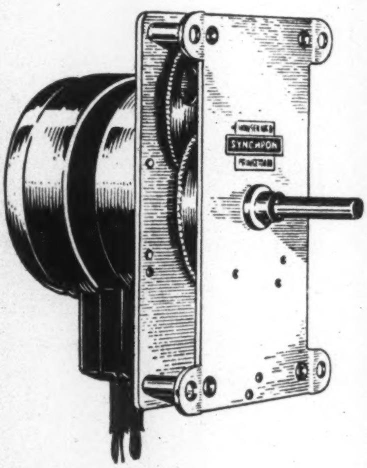
Your post-war Time Controls

- You want controlled power—consistent power—for time controls and time switches. Power that is measured out evenly with every electric impulse, giving utmost accuracy and reliability to the carefully geared machines you build.
- You get this power with SYNCHRON Timing Motors. Built to *take it*—with oil-impregnated double bearings, brass gears, hardened steel shafts—and a reputation for customer satisfaction that dates nearly a quarter of a century.
- SYNCHRON is at war—serving our Country on every battle front—with timing motors and time machines designed especially for tough fighting jobs. But our expanded facilities enable us to extend a cordial invitation to forward-thinking manufacturers to tell us about their time control problems. Write—

HANSEN MANUFACTURING CO., INC.
PRINCETON 6, INDIANA

SYNCHRON POWERED TIMING MACHINES

STANDARD INTERVALS: 1 RPM, 1 RPH, 1RP12H, 1RPD



- *The tiny, self-starting, self-lubricating synchronous motor—or the complete SYNCHRON Timing Machine—will meet your most exacting requirements for sustained power, compactness, and accuracy. Ask for engineering data.*

The Answer to Simplified . . . Faster Lower Cost DY-NAMIC BALANCING

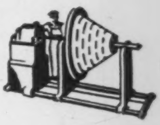
ONE OPERATION
SHOWS STATIC, DY-NAMI and STATIC DY-NAM

ADJUSTABLE BED
PERMITS BALANCING OF MANY SIZES AND TYPES OF BODIES ON ONE MACHINE

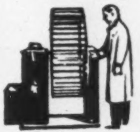
MICROMETER DIALS
CALIBRATED TO SHOW APPROXIMATE QUANTITY OF CORRECTION

New BEAR Dy-Namic Balancing
Now making possible many Improvements In Production and Product Performance

Among the production and product performance improvements reported by leading manufacturers now using the new, lower cost, Bear Dy-Namic Balancing Machines are these:



IN PRODUCTION:
Easy non-complicated operation — Less Time to Dy-Namically Balance to accuracy of government specifications . . . **detection of errors in pattern designs,** leading to improvements in moulding . . .



IN PRODUCT PERFORMANCE:
Reduction in wear . . . elimination of noise and vibration . . . improved efficiency . . . reduction in frequency of adjustment or repair . . .

Bear machines utilize a new, entirely different principle for the dy-namic and static balancing of rotating bodies to remove the couple-force actions resulting from dy-namic unbalance. Not only does this principle eliminate the need for delicate, complicated mechanism but it makes possible Dy-Namic Balancing Machines which are faster, more accurate, easier-to-operate and MUCH LOWER IN PRICE.

WIRE, PHONE, WRITE details of your problems today, or write for FREE DATA BOOK describing the many Bear Machines available to those with war industry priorities. Address Bear Mfg. Co., Industrial Division, Dept HPA, Rock Island, Ill.

THE MARK OF PRECISION

BEAR
COMBINATION
STATIC AND DY-NAMIC BALANCING MACHINES

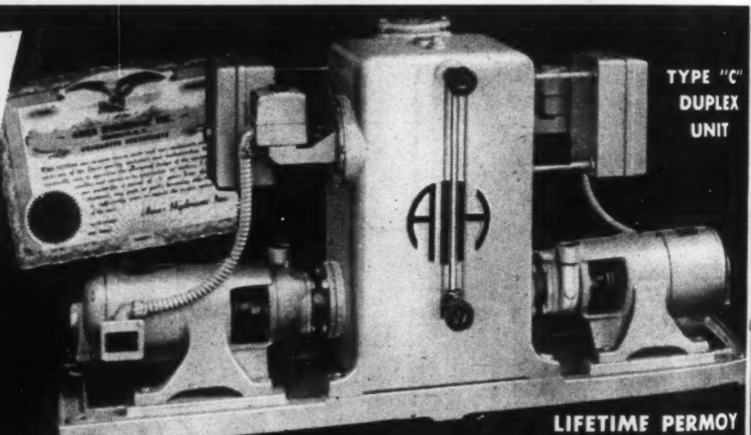
ANTHRACITE FINES: Solid Fuels Administrator Harold L. Ickes recently urged retail coal dealers in northeastern and middle Atlantic states to tap the huge surplus of anthracite in fine sizes as a source of additional tonnage for distribution this year. These fine sizes of hard coal are unsuited for household consumption, but when mixed with bituminous coals they can be utilized with advantage and without any loss of efficiency by many of the dealers' commercial, semi-commercial and industrial customers, he said. This new source of good coal can be used to offset shortages in the bituminous supply. Large tonnages of buckwheat No. 4 are available as well as quantities of buckwheat No. 3 (barley) and buckwheat No. 5.

BITUMINOUS: Pointing out that the Solid Fuels Administration for War had opposed coupon rationing of coal as impracticable, Secretary of the Interior Harold L. Ickes called last month upon the retail coal industry to shoulder its responsibilities in the program for equitable distribution of the nation's limited coal supply during the forthcoming winter. He announced the appointment of area advisory committees on local distribution in certain areas east of the Mississippi in which bituminous coal is the primary solid fuel consumed. These committees will assist consumers during the next heating season. They will assist the SFA in determining which areas are in emergency need of additional coal. The members of these area committees will serve without compensation.

BUY COAL NOW: Recalling that near-riots had occurred in coal yards during the first world war winter of 1917-18, Dr. C. J. Potter, deputy solid fuels administrator for war, urged the Missouri Retail Coal Association members last month to warn their customers that "it is better to buy what coal they can get now than to burn the Christmas tree next winter instead of hanging presents on it."

COAL DISTRIBUTION: An emergency coal distribution plan put into operation late last winter by the Philadelphia Council of Defense has worked so successfully that it is being studied and summarized by the Office of Civilian Defense and the Solid Fuels Administration for the information of other cities should the need arise next winter, OCD announced recently. Applications were sent not only to a central office but were received also at zone, sector, or post air raid warden headquarters. The applicant agreed to take any solid fuel available, to pay cash for it, and to be at home when the delivery was made. The form indicated the name of the consumer's regular coal dealer, the amount used the previous year, and the quantity received so far during the current year. The emergency order was sent through channels provided by the defense council to the coal dealer named on the form with the request that it be given priority. If he was unable to fill the order it was passed on to another dealer, who was compensated in coal by SFA for making the emergency delivery.

CONSUMERS MUST STORE COAL DESPITE GOVERNMENT STOCKPILE: Government coal stockpiling program now under consideration will not relieve consumers of necessity to build their own storage of coal as far as supplies permit, Deputy Solid Fuels Administrator Potter said May 23.



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LIFETIME PERMOY
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Write for Bulletin No. 200-A showing Consultants' Specification Form, Standard Ratings and Blueprint

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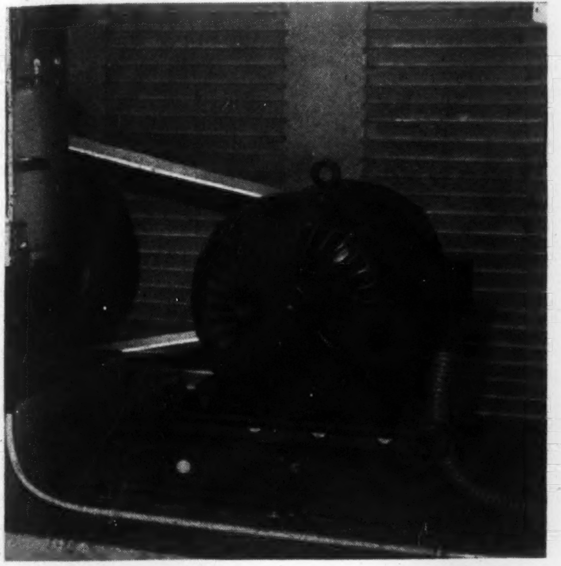
The Drive that gives you both DEPENDABLE OPERATION and ECONOMY . . . .

TANNATE-ROCKWOOD



For long dependable, trouble-free service on air conditioning equipment the Tannate-Rockwood is the drive to install. It consists of a Rockwood pivoted motor base with a Tannate Leather Belt. Tensions are automatically adjusted by the weight of the motor on the pivoted Rockwood base, so that even when the load fluctuates, high efficiencies are maintained. Tannate's tight pulley grip assures smooth running and a steady pull. The great strength and long life of the Tannate belt with practically no upkeep gives you the dependability and economy you want. Ask us for details.

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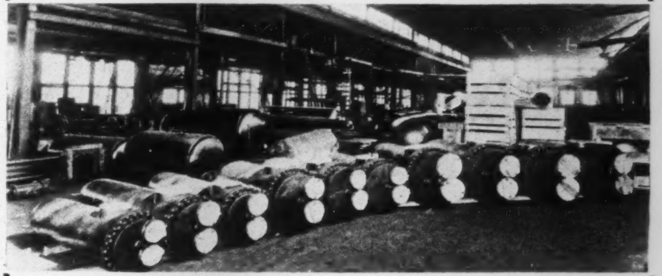
Order
HEATING EQUIPMENT
Now!

WHITLOCK CONVERTORS



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The advantages of forced circulation have never been greater than in these war days . . . smaller pipe sizes save critical material on installation, heating water may be efficiently carried long horizontal distances, and overloads are easily handled where necessary.

Whitlock Convertors are giving satisfaction and saving fuel in hundreds of installations.

Plan ahead. Write today for recommendations.

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Whitlock Equipment (Whitlock-Darling) is manufactured in Canada by Darling Brothers, Ltd., Montreal.

MORE HEAT
FROM
LESS COAL!
STOKERS

FREDERICK INDUSTRIAL

Hopper or Bin Feed Models. 200 to 850 lbs. per hour.

More than a claim—it's *an established fact* that FREDERICK INDUSTRIAL STOKERS effect important savings in tonnage and incidentally in labor and transportation as well. The reason? Every detail of FREDERICK STOKER CONSTRUCTION is designed to give you *maximum combustion efficiency* at the *lowest possible combustion rate per square foot*—the fully active grate area, the completely enclosed wind-boxes, the continuous speed type transmission ... These and other Frederick engineered features are fully described in our new Stoker catalog, copy of which we will gladly send you. Just write—

THE Frederick IRON & STEEL CO.
Frederick, Maryland

FUEL EFFICIENCY DRIVE PROGRESSES: Secretary of the Interior Ickes announced last month appointment of 58 additional coordinators in national fuel efficiency program as signed pledges of cooperation from scores of industrial executives in all parts of United States began coming in to the Bureau of Mines.

EQUIPMENT AND SUPPLIES

BRASS ALLOY TUBING: Full cooperation of industry will be required if production of brass alloy rod and tubing is to meet requirements, members of brass mill industry advisory committee of WPB said at their recent meeting.

CONTRACT TERMINATION: In an effort in its campaign to speed the submission of claims from war contractors whose contracts have been terminated, the War Department has cut through a morass of red tape by issuing the first standard termination forms. After May 15, Army contractors can set down on concise printed forms, all of the facts they wish to present in order to bring about a quick settlement of their terminated contracts with the War Department.

CONTROLLED MATERIALS: Direction 2 to CMP regulation 9A permits the use of material bought under the regulation to install various types of equipment, but only where other WPB orders do not forbid the use of a particular type of material for the purpose. In addition, this direction does not affect any limitation or prohibition upon the purchase of material or equipment imposed by any order of the WPB. For instance, this direction does not permit a repairman to install copper

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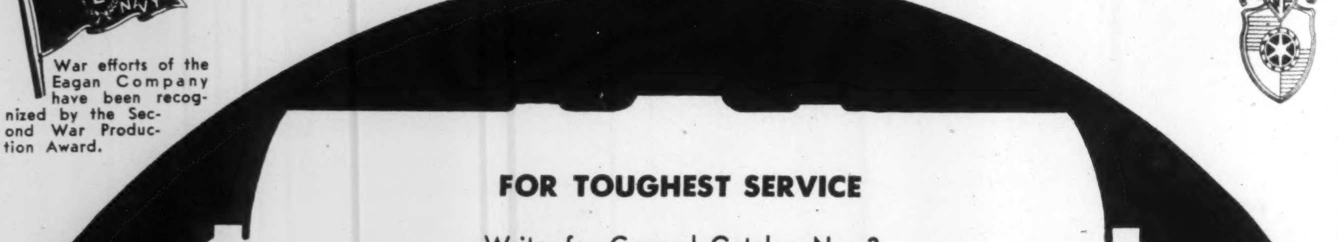

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or copper base alloy pipe, tubing or fittings or building material, except for those exceptional uses allowed by order M-9-c-4. Furthermore, a jobber who supplies repairmen with material is not relieved from the prohibition in order M-9-c-4 which prevents his selling, delivering, or otherwise disposing of those copper products if it is to be used for a purpose prohibited by order M-9-c-4, regardless of the fact that the purchase order may carry a CMP allotment symbol and certification or a preference rating. (Int. 1 to direction 2, CMP regulation 9A, May 2, 1944.)

CONTROLLED MATERIALS USE FOR REPAIR CLARIFIED: Repairmen are permitted to use up to $25 worth of material purchased under controlled materials plan regulation No. 9A for the installation of cooking, plumbing, heating, or used air conditioning or refrigeration equipment only on condition that use of such material is not otherwise prohibited by WPB rules and orders, WPB said last month.

COOLERS: A procedure for manufacture of certain types of evaporative coolers will be authorized, WPB said May 19. (Direction No. 1 to limitation order L-38.)

COPPER EQUIPMENT: Freeing of frozen inventories of certain listed copper-containing items of heating equipment and building material was announced by WPB May 23.

COPPER IN NEW HEATING UNITS: Limited restoration of copper and copper base alloy products to

CALIFORNIA SUNSHINE
DOESN'T KNOW WHEN
TO STOP!

In the making of wine the period of fermentation is critical and the temperature of the fermenting grapes must be under control if good wines are to be produced. In California's great Central Valley the temperatures are not infrequently around 115°F for fairly long periods. Handling large quantities of grapes and keeping the temperature down during fermentation becomes an engineering problem. Such was the problem that faced California Grape Products Company producers of *Victor H.O.L. Brand California Wines.* At their winery near Delano, California fermentation took place in large concrete vats in which the greater part of the heat was dissipated to water circulated through copper coils in the tanks. Some heat, however, rose to the top of the building where the heat from the sun is also considerable. California Grape Products Company engineers recognized this and wished to provide some positive means of heat removal independent of wind or weather. Allen Corporation engineers were consulted. As a result Allen Type "H" Roof Fans were installed. Temperatures are now held at levels that insure a good product and controllable by the Vintner in charge. *The Allen Corporation, 9751 Erwin Avenue, Detroit 13, Michigan.*

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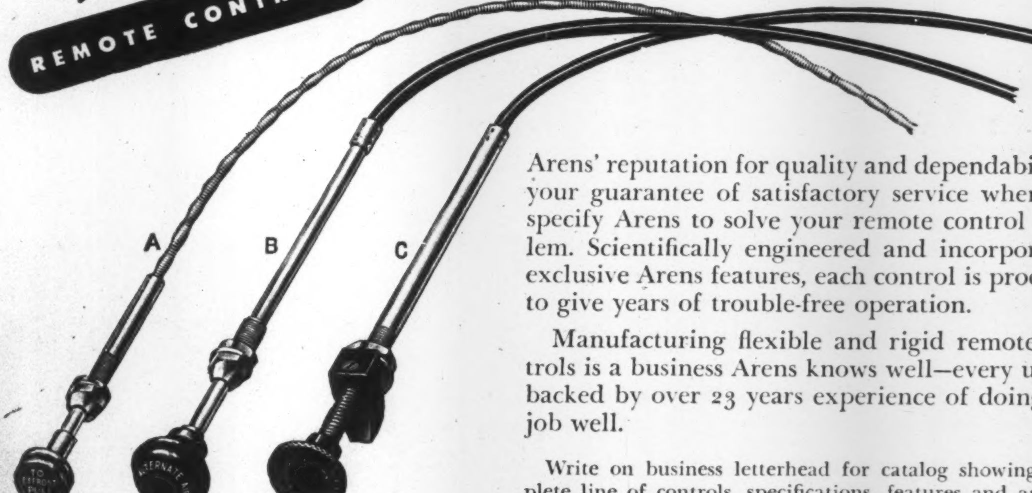

Arens' reputation for quality and dependability is your guarantee of satisfactory service when you specify Arens to solve your remote control problem. Scientifically engineered and incorporating exclusive Arens features, each control is produced to give years of trouble-free operation.

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Control Heads (A) shows locking type head which permits rapid push-pull adjustment and permanent locking by spring actuating button control. (B) one of many styles of standard rapid push-pull control heads. (C) Vernier control head permits rapid push-pull adjustment or rotating micro-fine adjustment in the same control.

ARENS CONTROLS, INC.
2267 South Halsted Street, Chicago, Illinois

ITS UNDER PERFECT CONTROL IF ITS ARENS

replace steel in the manufacture of specified items of extended surface heating equipment was announced last month by WPB amendment of conservation order M-9-c.

CORROSION INHIBITORS: Fees and charges for corrosion inhibitor services for boilers and heating systems are exempt from price control, OPA announced as effective May 27. This service consists of a special analysis of the customer's need for a corrosion inhibitor in his heating system by a person with the necessary technical knowledge and the use of prescribed chemicals to retard the corrosive action. The technical knowledge of the person giving the service, rather than the material used, is the important factor involved in retarding corrosion within a heating system, according to OPA.

FORGINGS: Minimum preference rating has been raised to AA-5 and higher for delivery of iron products and carbon on alloy steel forgings as result of amendment of basic WPB general preference order M-21, WPB said last month.

GAGES: Compilation of list of quantities of available idle stocks of bourdon tubing for pressure gages was recommended at meeting of dial pressure gage industry advisory committee, WPB reported recently.

INSTRUMENTS: Conservation order L-134, which restricted use of chromium, nickel, or any alloy of these materials in manufacture of industrial instruments, control valves, and regulators, was revoked by WPB last month.

IRON AND STEEL: Acting to speed the flow of excess stocks of iron and steel products which may be disposed of in substantial volume as the heavy production phase of the arms program nears its completion, the OPA last month announced specific ceiling prices for transfers of such excess supplies, effective June 1, 1944.

METAL JACKET CONTROL RELAXED: Prohibition on use of metal jackets for water heaters has been relaxed to permit use of steel in manufacturers' inventories on May 8, 1944, and such steel as may be obtained from frozen, idle, and excess inventories, WPB has reported.

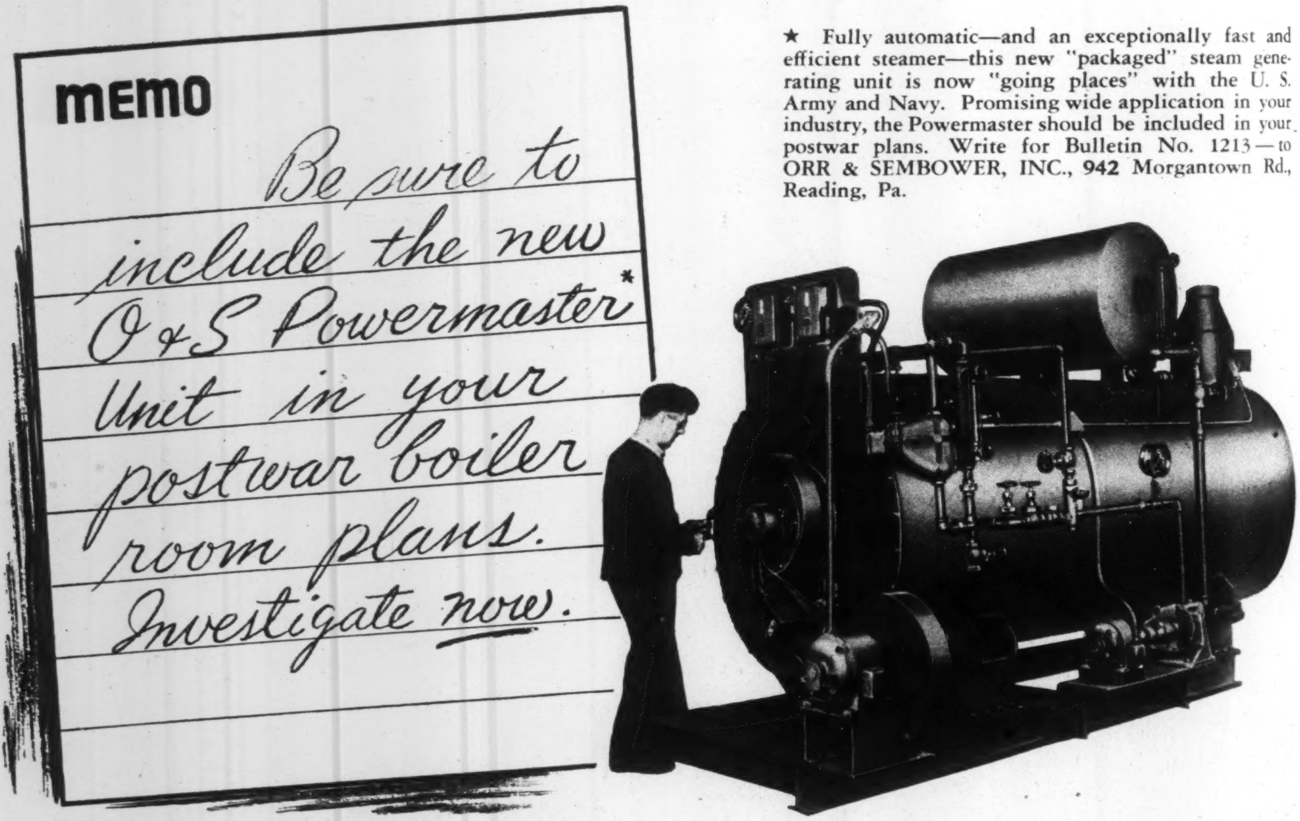
REFRIGERATION: Shipments of combat material from 85 plants that were engaged primarily in manufacture of domestic and commercial refrigeration equipment before war reached alltime high of almost $150,000,000 in last quarter of 1943, WPB reported.

REFRIGERATION: The industry advisory committee representing manufacturers of commercial refrigeration condensing units will meet with OPA officials in Washington on June 13, OPA has announced.

REFRIGERATION FORMS: After May 25, 1944, applications for priorities on refrigeration equipment other than industrial processing and air conditioning equipment will be filed with WPB field offices, WPB announced May 18.

REPAIR PARTS: WPB's refrigeration and air conditioning section of the general industrial equipment division has informed manufacturers and trade associations that WPB is prepared to uprate to AA-1 orders for certain repair parts used by the industry.

STERILIZER EQUIPMENT: Sterilizer equipment, formerly obtainable for civilian use by special authorization on WPB form 1319, may be bought for use in



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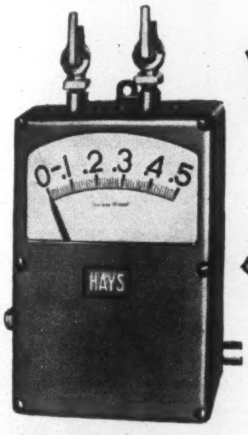
★ Fully automatic—and an exceptionally fast and efficient steamer—this new "packaged" steam generating unit is now "going places" with the U. S. Army and Navy. Promising wide application in your industry, the Powermaster should be included in your postwar plans. Write for Bulletin No. 1213—to ORR & SEMBOWER, INC., 942 Morgantown Rd., Reading, Pa.

approved construction projects when authorization is given for specific equipment on project authorization (form GA-1456), WPB has announced.

VALVES: Two changes in definition of a "reconditioned valve" in regulation governing pricing of reconditioned and used valves were announced by OPA. (Amendment 128 to revised suppl. reg. 14 to GMPR, effective May 8.)

OIL

OIL RATIONING ORDER: Amendment 3 to revised oil ration order RO 11, effective April 22, modifies the provisions governing rations for boats. Amendment 4, effective May 10, provides for the renewal of rations for the year starting September 1, 1944, and ending August 31, 1945. Amendment 5, effective May 15, provides that householders again this summer can obtain oil rations for use in oil cooking stoves and hot water heaters even though they may have a coal or wood burning stove available. Amendment 6, effective May 19, provides that current period 4 and 5 coupons will continue to be good for deliveries of oil through September 30, rather than expiring on August 31 as previously announced. Amendment 7, effective May 20, provides that OPA district directors may authorize fuel oil dealers and suppliers who have been cited for "pre-tailoring" consumers' ration coupons to deliver oil against these coupons without being in further violation of the regulations; the action was necessary in order to prevent hardship to the consumer whose coupons were pre-tailored by his supplier without the consumer's knowing anything about it.



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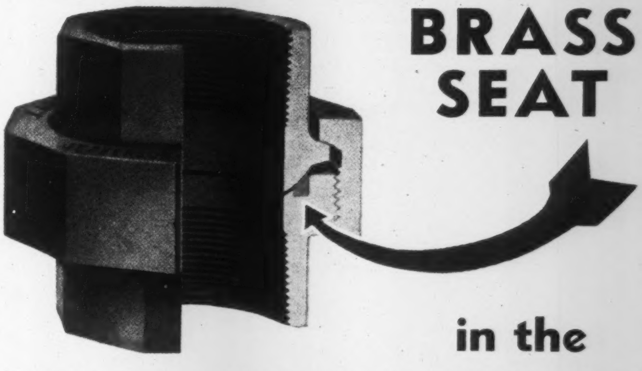

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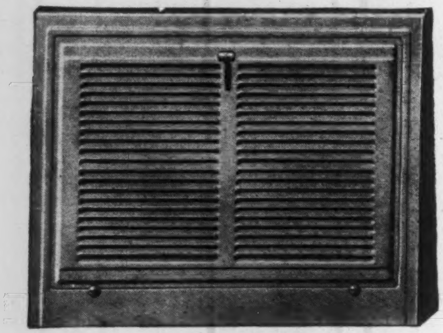

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No. 4700—6 p. form (3-44) giving engineering specifications for "Janitrol" aircraft heaters which are built on the whirling flame principle. Combustion air regulation and other details for vaporizing or spray type models of 15,000, 50,000, 100,000, and 125,000 Btu capacity units are included.—Surface Combustion, 2375 Dorr St., Toledo, Ohio.

Brass Products

No. 4701—16 p. booklet giving the story behind the manufacturer's organization, production facilities, and products.—Turner Brass Works, 823-47 Park Ave., Sycamore, Ill.

Central Heating

No. 4702—6 p. folder (FM-4402) on the advantages of central heating, stressing the incorporation of central heating in postwar community or group planning. Central heating for municipalities, for real estate developments, for large and small housing projects, for hospitals and colleges, and for industrial groups is discussed and installations are shown. Importance of the distribution lines is stressed.—Ric-wiL Co., 1562 Union Commerce Bldg., Cleveland 14, Ohio.

Compressors and Vacuum Pumps

No. 4703—32 p. catalog (F-1502) of compressors and vacuum pumps in sizes from ½ to 10 hp, including information on a three-stage dual pressure portable and two three-stage high pressure units. The dual pressure portables are designed particularly for use at airports in the servicing and repairing of planes.—Ingersoll-Rand Co., 11 Broadway, New York, N. Y.

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No. 4704—12 p. catalog on "Heacon" industrial dampers, including a number of case histories and diagrams showing how proper damper installations have resulted in increased efficiency in a wide variety of applications. There are discussions of such factors as binding in dampers, warped shafts, dynamic balance, power requirements, and maintenance.—Thermix Engineering Co., Greenwich, Conn.

Drawing Instruments

No. 4705—4 p. bulletin describing and illustrating various sets of drawing instruments.—Charles Bruning Co., Inc., 42-33 Ninth St., Long Island City, N. Y.

Grommets

No. 4706—4 p. folder describing and illustrating a new "Dura-Grom" grommet which is a fume and water tight and vibrationproof unit for supporting lines through a firewall or bulkhead. Data are given on available models, specifications, applications, and features.—Arens Controls, Inc., 2253 S. Halsted St., Chicago 8, Ill.

Heat Exchangers

No. 4707—4 p. bulletin (96) on "Balanced Wet Bulb Aero" heat exchangers for the constant and accurate control of temperature in liquids or gases. Sketches and illustrations of construction features are included and a short but thorough discussion of operating principle is presented.—Niagara Blower Co., 6 E. 45th St., New York 17, N. Y.

Humidity Control System

No. 4708—4 p. folder on the "Kathabar" humidity control system using package units, available in sizes for 1350, 2500, 3500, and 5000 cfm. A brief summary of various applications and the principle of operation are covered.—Surface Combustion, 2375 Dorr St., Toledo, Ohio.

Instruments

No. 4709—4 p. bulletin (2982) on "Alnor" instruments, giving a condensed description of pyrometers, electrical resistance thermometers, temperature controllers, and the "Velometer"—a direct reading air velocity meter.—Illinois Testing Laboratories, Inc., 420 N. La Salle St., Chicago 10, Ill.

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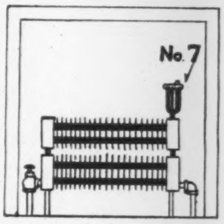
And Keep It Out With

AUTO-VENT AIR ELIMINATORS



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Don't fight air pockets or traps in hot or cold circulating lines? "Get that air out of there" *and keep it out* simply by installing the No. 7 Maid-O'-Mist Automatic Air Vent. This reliable air vent has a self-closing float-controlled valve and is designed especially for circulating pipe lines, concealed radiators, unit heaters, cooling manifolds, tanks, diesel engines, or any other application where air pockets or traps retard the free circulation of liquids. Now available in bright brass finish.

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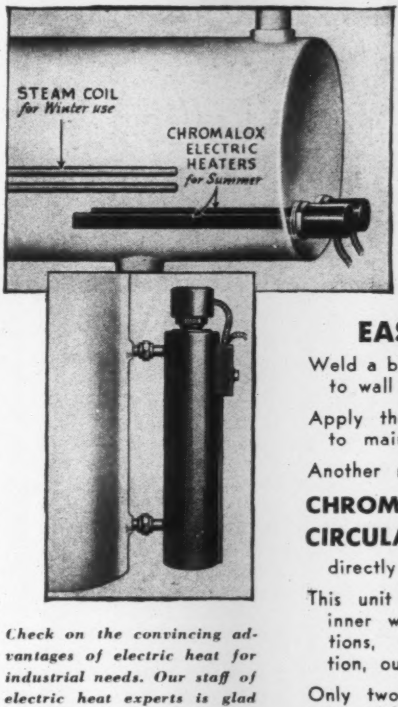

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CHROMALOX IMMERSION HEATER

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Heat the water by electric heat, automatically controlled, needing little or no attention.

EASY TO APPLY

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Apply thermostat, suitably located, to maintain desired temperature.

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directly to tank.

This unit is complete with heater, inner water jacket, pipe connections, thermostat, heat insulation, outer jacket.

Only two simple pipe connections to tank needed, and wiring connection to power line.

Check on the convincing advantages of electric heat for industrial needs. Our staff of electric heat experts is glad to work with you. Chromalox 64-page Catalog on request.

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PUMPS "by Aurora"

The splendid record of thousands of Aurora Pumps on a myriad of war services is your assurance that your postwar needs will be taken care of superbly as you, too, install Pumps "by Aurora"—the Products of Experience—made by exclusive builders of fine pumps.

Aurora Deep Well Turbines for all conditions—4" to 24"

Type AD Hor. Split Case, Two Stage Centrifugal

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APCO TURBINE-TYPE PUMPS—the simplest of all pumps. Ideal for small capacity, high head duties. Silent, compact and lasting.

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ONLY THIS SHAFT SEAL
COULD DO THIS JOB

Only hydraulic forming could produce the even-walled pre-tested metallic bellows that would stand the high pressures to which this torque converter shaft seal is subjected.

Only Clifford could make them big enough for the job. So we got the assignment. It was easy because we had solved a similar problem* for automobile fluid-drive couplings.

If you have a shaft seal problem — call Clifford, who produced *industry's first hydraulically-formed bellows* and who is still *first with the facts*. For 44 pages of facts on hydraulically-formed bellows, write for Hydron Data Book. Clifford Manufacturing Company, 562 E. First Street, Boston 27, Massachusetts.

*Silver-soldering steel nose to Hydron bellows and then flame-hardening it without annealing the bellows.

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First with the Facts on Hydraulically-formed Bellows

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Lubrication

No. 4710—Issue of Lubrication (Vol. 30, No. 4) devoted to the lubrication checkup, advantages of regular checkups, "bad actors" which require special attention, how the principles of mechanics affect the choice of lubricants, why operating conditions should be studied, etc.—The Texas Co., 135 E. 42nd St., New York, N. Y.

Lubrication

No. 4711—8 p. bulletin on the "LubroMeter" centralized lubrication system for industry; 8 p. bulletin on progressive lubricating system for industry; 8 p. bulletin on dual progressive system for industrial lubrication; and 8 p. bulletin on dual manifold system of lubrication. In each bulletin, the equipment is illustrated in detail and its advantages discussed.—Alemite Industrial Lubrication Div., Stewart-Warner Corp., 1826-1852 Diversey Parkway, Chicago 14, Ill.

Motors and Generators

No. 4712—Two 2 p. data sheets giving detailed information on dimensions and other data on sleeve and ball bearing direct current motors and generators in integral horsepower sizes.—Century Electric Co., 1806 Pine St., St. Louis 3, Mo.

Oil Reclaimer

No. 4713—4 p. bulletin (YM-700) on new "Robot" oil reclaimer available in capacities ranging from 4 to 300 gph. These units are used for restoring all kinds of lubricating, hydraulic, cutting, and vacuum pump oils for re-use.—Youngstown Miller Co., Sandusky, Ohio.

Photographic Reproductions

No. 4714—4 p. bulletin on the "Copyflex" continuous printer for making photographic reproductions, which accommodates prints up to 42 in. widths.—Charles Bruning Co., Inc., 42-33 Ninth St., Long Island City, N. Y.

Resistance Welding

No. 4715—28 p. publication (GET-1189) on resistance welding as a modern method of metal fabrication with sections on methods and equipment, equipment selection, electrodes and their maintenance, and material and its preparation for welding.—General Electric Co., 1 River Rd., Schenectady, N. Y.

Sight Flow Meters

No. 4716—32 p. catalog section (10-B) on "Rotameter" sight flow meters, thoroughly illustrated with many unusual sketches, drawings and photographs, and with a careful discussion of what such meters will do, how they work, their simplicity and reliability, their resistance to corrosion and low pressure loss, their accuracy, and with a listing of liquids and gases for which such meters are in use. Installation considerations for easy access and cleaning are also covered.—Fischer & Porter Co., 973 County Line Road, Hatboro, Pa.

Synthetic Rubber

No. 4717—70 p. book with numerous illustrations and statistics on synthetic rubber, and including data on freeze resistance, hardness, heat, fuel resistance, aging, etc., and with installation drawings of V seals, flange seals, cup seals, etc., and with data on extrusions, molded parts, sheets, rolls, and cut parts.—Acadia Synthetic Products Div., Western Felt Works, 4115 Ogden Ave., Chicago, Ill.

Tools

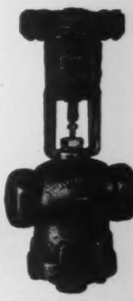
No. 4718—20 p. brochure covering the history, development, features, and specifications of the recently introduced "Thor" plastic housed portable electric drill, presenting specific sections on the advantages of this new tool "which represents a revolutionary application of plastic." The booklet is also a colorful and interesting exposition of the growing application in the use of plastics for many industrial purposes. Because of a limited supply and distribution of this booklet, it can be made available only to key executives.—Independent Pneumatic Tool Co., 600 W. Jackson Blvd., Chicago 6, Ill.

Underwriters' Laboratories

No. 4719—32 p. booklet on the Underwriters' Laboratories, which is a "non-profit, scientific and technical organization devoted to the safeguarding of lives and properties from the hazards of fire, casualty and crime" established in 1894. There is included a list of publications and standards issued by the laboratories and many illustrations of various test methods.—Underwriters' Laboratories, Inc., 207 E. Ohio St., Chicago, Ill.

Ventilation Equipment

No. 4720—Eight new pieces of literature which together illustrate and describe approximately half of the manufacturer's line of ventilating equipment. Of particular interest is a series of three bulletins covering three types of turbine ventilators and giving in simple



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PRESSURE ACTUATED
CONDENSING
WATER REGULATORS

Individually tested for efficient operation—these valves will give dependable, trouble-free performance. Diaphragm operated — For Ammonia, Methyl or Freon. Type WM incorporates a high pressure safety cut-out. Both types available in sizes ranging from 3/8" FPT to 2" FPT.

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Efficient operation of vapor heating systems requires the return of all water of condensation to the boiler without allowing it to build up in the returns. This is efficiently accomplished by the Sarco receiver or boiler return trap shown.

It collects the condensation and discharges it periodically to the boiler.

Available in four sizes and capacities, up to 14,000 sq. ft. direct radiation. Ask for Catalog No. 165.

SARCO SAVES STEAM

SARCO COMPANY, INC.
475 Fifth Avenue, New York 17, N. Y.
SARCO CANADA, LTD., 85 Richmond St. W., TORONTO, ONT.

187

AIR CONDITIONING NOZZLES

Nozzles of unique Yarway Involute Design.

No internal parts or vanes to clog or erode.

Insure trouble-free air washing service.

Sizes and types for all requirements.

Many large users—installations total more than 5 million gallons per minute in water cooling and air conditioning service. Write for Bulletin N-616.

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No More Damage from Condensation or Sweating Pipes, Tanks, Walls, Ceilings and Air Ducts

NoDrip A SURE CURE

● This sensational plastic cork coating prevents condensation drip from metal, concrete, brick, wood, plaster or composition surfaces. Permanently protects metal against rust and corrosion, thus prolonging life of pipes, tanks, etc. Forms a moisture-proof, insulation type coating impervious to acid and alkali.

Stucco-like finish requires no maintenance. A gallon covers about 30 feet of ½" pipe. Dries in 24 hours. Comes in 1, 5 and 55 gallon drums.

Immediate Shipment. Order from your Supply House.

FREE NoDrip Circular about Condensation Drip and its Prevention.

APPLY WITH BRUSH, TROWEL OR SPRAY

J. W. MORTELL CO.
Technical Coatings Since 1895
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ALL MARTOCELLO SPRAY NOZZLES are manufactured with precision and of a design which has been thoroughly tested for maximum results and durability. They are guaranteed to give satisfaction. Successful, efficient results depend largely upon selecting the proper number, type and size of Nozzles suitable for your installation.

THE MARTOCELLO CONDENSER WATER DISTRIBUTORS are now used as standard equipment by Progressive Refrigerating Engineers in solving their Manpower problem, because they require no attention and assure users of the lowest Condenser Operating Pressures and Minimum Power Cost.

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"Serving the Ice Industry Since 1916" "There is no Substitute for MARTOCELLO QUALITY"

diagrammatic form the basic functions and comparative efficiency of various types of ventilators.—The Allen Corp., 9767 Erwin Ave., Detroit, Mich.

Ventilators

No. 4721—Folder describing new "Iron Lung" power roof ventilators exhibited for the first time at the recent war production foundry congress. Features are carefully described and illustrated.—Powermatic Ventilator Co., 4019 Prospect Ave., Cleveland, Ohio.

Water Heaters

No. 4722—4 p. catalog (TW-95c) on "Tabasco" welded steel water heaters giving specifications, dimensions, and construction features, with a diagram of piping connections to storage tanks.—Kewanee Boiler Corp., Franklin St. and "Q" Tracks, Kewanee, Ill.

Welding Preheating and Interpass Temperature

No. 4723†—A new calculator designed for readily determining the welding preheating and interpass temperatures of steels in those cases where experience indicates the need for preheating to obtain the best welding results. The calculator is 6¼ in. in diameter and consists of four movable sections of heavy cardboard stock. Complete instructions for use are printed on the outside sections. This calculator may be ordered from the Lincoln Electric Co., 12818 Coit Rd., Cleveland 1, Ohio, for 25c.

Welding Supplies

No. 4724—20 p. revised price list of gas and electric welding supplies and accessories, including welding rods, hard facing alloys, brazing alloys, fluxes, helmets, goggles, gloves, aprons, welding cable, cable lugs, ground clamps, brushes, and weld cleaning tools.—Air Reduction Sales Co., 60 E. 42nd St., New York 17, N. Y.

X-Ray Units

No. 4725—4 p. bulletin on "Searchray" electronic self-contained industrial x-ray units for internal inspection of castings, parts, assemblies, etc., for locating flaws, defects, and improving quality.—North American Philips Co., Inc., 100 E. 42nd St., New York 17, N. Y.

Zinc

No. 4726—24 p. booklet on how zinc saves steel from rusting, discussing prevention of corrosion, functions of metal protective paints, and properties and applications of various types of such paints. There is also a summary of primer and finish paint specifications requiring zinc pigments in their formulation.—New Jersey Zinc Co., Front and Fletcher Sts., New York 7, N. Y.

†Write manufacturer direct.

How Army Handles Production Cut-Backs

The Army Service Forces have prepared a booklet describing the adjustment of production cut-backs, its purpose being to outline simply and graphically "the consideration and detailed planning the Army accords to any necessary reduction in production programs and resultant cancellation of contracts." It is understood that copies of the booklet are available from the Bureau of Public Relations, War Department, Washington, D. C.

• MEETINGS & CONVENTIONS •

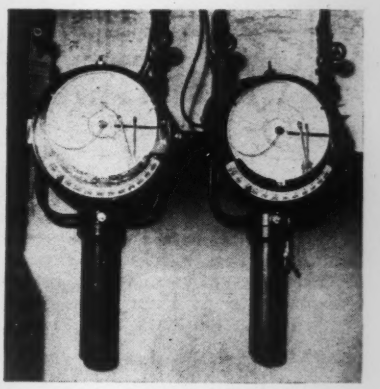
District Heating Association

National District Heating Association, 35th annual meeting, June 14-15, William Penn Hotel, Pittsburgh, Pa. Program includes reports of officers and committees and the papers to be given include discussions on sizing economizers and condensate coolers, by W. A. Schulmeister, American District Steam Co.; steam consumption for water heating, by A. F. Metzger, Allegheny County Steam Heating Co.; sprinkler tank water temperature control, by George H. Tuttle, The Detroit Edison Co.; correlation of steam use in buildings and use of district steam in certain types of air conditioning, by A. R. Mumford; degree day standardization, by John F. Collins, Jr.; studies on use of amines in control of corrosion in steam heating systems, by A. A. Berk, U. S. Bureau of Mines; results of corrosion research work at Carnegie Institute of Technology, by D. S. McKinney, of Carnegie Institute; corrosion in steel coal bunkers; problems in use of inferior wartime coals; use of concrete poured directly around an underground steam line; cell concrete jobs, by Mr. Schulmeister; installation of a 1000 ft temporary high pressure main to an industrial user; lengthening the life of underground steam lines, by A. A. Selke, The Detroit Edison Co.; electrolysis of underground steam mains; experience with a diaphragm operated relief valve, by

ADSCO

FLOW METERS

CAN'T BE DAMAGED BY SUDDEN OVERLOAD OR REVERSE FLOW



Accurate Under Severe Operating Conditions

ADSCO Flow Meters record on direct reading, evenly divided charts and totalize the flow. Changing chart and inking pen can be performed quickly by an unskilled attendant without the least chance of damaging the mechanism or disturbing any adjustments.

Available in four types with standard or high velocity body as follows: Recording—Recording and Integrating—Indicating and Recording—Indicating, Recording and Integrating—with or without auxiliary pressure recorder to record working pressure on same chart as flow.

Write us regarding your meter problems, also ask for Bulletin No. 35-83 HP.

AMERICAN DISTRICT STEAM COMPANY NORTH TONAWANDA, N. Y.

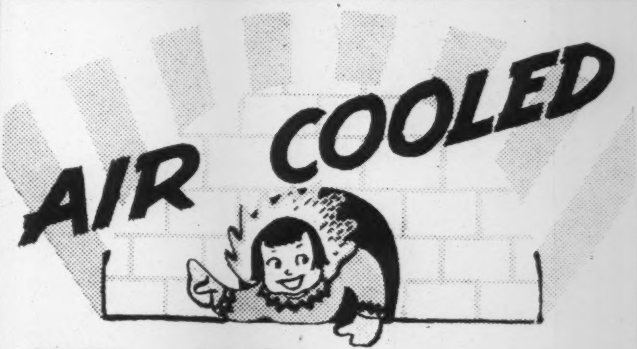
Making "UP-TO-DATE" Steam Line Equipment for over 60 years

WING REVOLVING UNIT HEATERS

Wing Revolving Unit Heaters insure uniform mixture and circulation of heated air by the use of discharge outlets which revolve slowly and project the streams of heated air to the working level sweeping around in a complete circle. As the moving air circulates along the working level, it mixes uniformly with the cold air, circulates around heavy machinery and obstructions and penetrates into cold, damp corners—insuring a comfortable uniform temperature throughout the entire plant. These Wing Revolving Heaters are suitable for all types and sizes of buildings because the deflectors on the discharge outlet can be adjusted to propel the air in two different concentric circles which permits coverage of a great area.

L. J. Wing Mfg. Co.

14th St. & 7th Ave., New York, N. Y.—Factories: Newark, N. J.



BUT . . . Is Your AIR-CONDITIONING SYSTEM CLEAN?

Are there dust smudges on your walls and ceilings? Are you breathing dust or clean fresh air? Are you getting maximum efficiency? Now you can have your Air-Conditioning System cleaned.

Do It The C.S.C. Way!

Chemical Service cleans and treats air conditioning systems for the prevention of dust accumulation into a room. Work done without interruption to your business. Don't Delay! Write or Phone

Here's What C.S.C. Will Do For You!

- Accessible duct areas thoroughly cleaned and vacuumed.
- Plenum chamber, filters, coils, ducts and grilles cleaned.
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Air Conditioning Engineer

National organization has West Coast opening for mechanical engineer to design heating, ventilating, and air conditioning systems for its retail stores. Thorough technical training plus specialized experience desirable. Major consideration is experience with equipment used for extreme temperatures and under a wide range of conditions. Permanent connection with attractive future for man who makes good. Salary open. Replies held confidential. Send letter giving age, draft status, education, and detailed employment record. Address Box No. 405-A,

Heating, Piping & Air Conditioning
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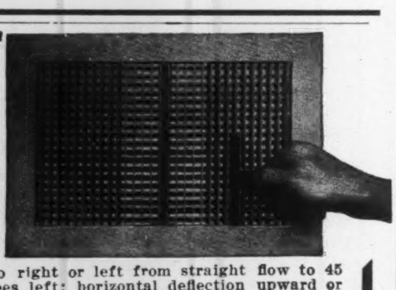
DOUBLE ADJUSTABLE GRILLES

Design 5050VA—Made in all Standard Sizes; special sizes made to order. Vertical bars on face are adjustable in groups; horizontal bars on back are similarly adjustable. Back louvres can be adjusted from face. Allows vertical deflection of air to right or left from straight flow to 45 degrees right and 45 degrees left; horizontal deflection upward or downward from straight flow to 45 degrees either direction.



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Specify Precision Processed STANFORATED Perforations. Industrial Screens, Filters, Guards, etc., made to specifications for vital industries. Handy catalog sent on request.

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BURKS **SUPER TURBINE**

Completely Automatic
WATER SYSTEMS

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- **Completely Automatic**
- **Self Priming**
- **One Moving Part**
- **Wide Capacity Range**
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The Burks line gives dealers the proper water system to meet most every customer's need. It's a quality line you can sell with confidence that it will out-last, outperform and require less service than ordinary water systems. Your reputation as a good water system man grows with every BURKS Sale you make.

DECATUR PUMP CO., 41 Elk St., Decatur 70, Illinois

G. T. Siebenthaler, Dayton Power and Light Co.; inspection, testing, and reading of steam meters, by Henry L. Warhanek; changes in testing and maintenance of condensation meters due to wartime conditions, by Richard H. Brown, Rochester Gas and Electric Corp.; effect of testing meters biennially or triennially instead of annually on meter accuracy, by Mr. Warhanek; and others. R. J. J. Tennant, National Association of Building Owners and Managers, will give a talk entitled From the Other Side of the Fence. John F. Collins, Jr., 827 N. Euclid Ave., Pittsburgh, is secretary-treasurer of the NDHA.

Heating and Ventilating Engineers

American Society of Heating and Ventilating Engineers, semi-annual meeting, June 19-20, Pantlind Hotel, Grand Rapids, Mich. See ASHVE Journal Section in this issue for further information. Secretary of the ASHVE is A. V. Hutchinson, 51 Madison Ave., New York 10, N. Y.

Mechanical Engineers

American Society of Mechanical Engineers, semi-annual meeting, June 19-22, William Penn Hotel, Pittsburgh, Pa. Problems of industry, production, transportation, and management will be discussed and many inspection trips to modern plants will be arranged. Headquarters office of the ASME is at 29 W. 39th St., New York, N. Y.

Power Engineers

National Association of Power Engineers, 62nd national convention, August 22-25, Hotel Jefferson, St. Louis, Mo. F. C. Laufketter, Hotel Jefferson, St. Louis, is general chairman of the local convention committee. The 44th National Power Show will be held concurrently.

Chemical Exposition and Conference

National Chemical Exposition, November 15-19, Chicago Coliseum, 15th and Wabash, sponsored by the Chicago section of the American Chemical Society. Marcus W. Hinson, 330 S. Wells St., Chicago 6, Ill., is the exposition manager. A feature of the show will be the National Industrial Chemical Conference.

Food Dehydration

The National Fire Protection Association, 60 Batterymarch St., Boston 10, Mass., has published a 20 page illustrated booklet on Food Dehydration by Gerald W. Hallowell, which discusses in non-technical language the various processes and the most up-to-date fire protection and prevention measures for combating the fire and explosion hazards of the industry. The most significant fires which have occurred recently in the industry are listed with their causes when known. According to the NFPA, there are now more than 1600 food dehydrating plants operating in 24 states. It is stated that wood has been used to a large extent in the construction of the buildings and process equipment, owing to the shortage of metal and other fire resistive materials, and that the combination of heat for drying, forced air draft circulation, and combustible construction "is an invitation to fire." Copies of the booklet may be obtained from the NFPA for 35c.

EQUIPMENT DEVELOPMENTS

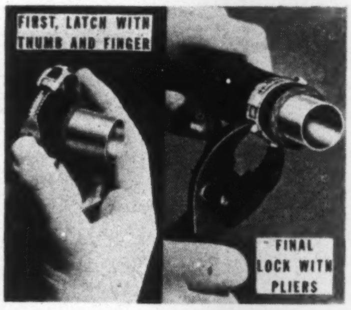
For your convenience in obtaining more information about any of this equipment, see coupon on this page. Add the new products and companies listed here to your Directory Section which you received in your January 1944 Heating, Piping & Air Conditioning and thus keep your records of sources of supply up to date throughout the year. Single asterisk indicates equipment not listed in Directory Section; double asterisk equipment and manufacturer not listed.

Portable Weld Testing Machine

No. 2643—An improved portable weld testing machine is available to perform reduced section transverse tension tests, the guided bend test (a complete 180 deg face or root bend), and the longitudinal all-weld-metal tension test. The advantages of this machine, as stressed by the manufacturer, are its ability to provide accurate data on tensile strength and ductility of weld specimens as determined by these three tests and its relatively light weight, which enables users to perform weld tests right on the job. This feature makes the machine "particularly useful for firms doing extensive field work, such as pipe line installations, construction, and similar jobs in remote locations." The machine operates on the hydraulic jack principle, a hand operated pump transmitting pressure through a hose to the plunger. While the maximum direct load is 40,000 lb, the use of reduced section specimens permits tests on metals of 150,000 psi or higher tensile strength. Jaws for making the transverse tension test, and the plunger and die for the guided bend test, are supplied with the machine. Jaws for the longitudinal all-weld-metal tension test are furnished on special order.—Air Reduction Sales Co., 60 E. 42nd St., New York 17, N. Y.

One Piece Hose Clamps

No. 2644—A new one piece hose clamp "using no gears, thumb screws or intricate locking means," may be snapped over the hose into a pre-latched position by hand, as shown at the left of the illustration, the final lock being made with hand pressure on ordinary pliers, as shown at the right. The clamp may be quickly released for removal with an ordinary screw driver or other pointed tool. It is made of SAE 1060 spring steel, with parkerized and zinc chromate primer finish, and is available for all sizes of AN and ordnance specification hose from ½ in. OD and up.—Tinnerman Products, Inc., 2018 Fulton Road, Cleveland 13, Ohio.

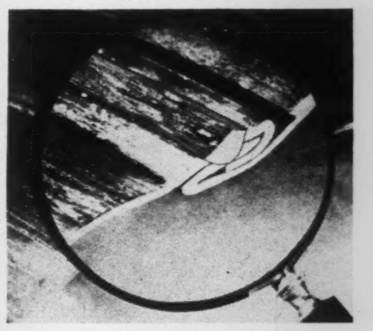


Insulating Windows

No. 2645—The availability of "Thermopane" was announced at a recent meeting of the Architectural League in New York City, and the properties of this transparent window insulation were demonstrated. The unit—offered for use in apartment buildings, hospitals, schools, office buildings, etc., in order to conserve fuel—consists of two panes of glass sandwiching a dehydrated air space which is hermetically sealed in by a special metal to glass bond. To demonstrate the reduction of heat loss through the double glass unit as compared to ordinary window panes, an electronic potentiometer was attached to a cold test cabinet equipped with windows of the two kinds of glass. When the cabinet's interior temperature was reduced to zero, the instrument showed a 20 F difference between the two sides for the double glass with only 1 deg of difference for the single pane of glass. The manufacturer expects that buildings of the postwar era will have the double glass installed in a single sash like regular window glass in order to reduce heating costs, eliminate cold drafts and fogginess, and to subdue street noises.—Libbey-Owens-Ford Glass Co., Nicholas Bldg., Toledo 3, Ohio.

Welded Lock Seam for Pipe Conduit

No. 2646—Helical corrugated conduit housing for "Ric-wiL" prefabricated pipe units is now furnished with a reinforcing full welded lock seam extending spirally the entire length of each section. The automatic machine weld is made at the factory before galvanizing to insure a pressure tight, waterproof structure. The sections are 21 ft long, completely fabricated with pipe or pipes as specified, insulation, and aligning pipe supports. The conduit ends are expanded smooth for a distance of 3 in., removing corrugations to facilitate tight field connection of the sections. This insulated conduit is available in several types for piping steam, hot water, oil, and hot or refrigerated process liquids. Installation may be above surface or underground, the latter requiring only a narrow and shallow trench.—Ric-wiL Co., 1562 Union Commerce Bldg., Cleveland 14, Ohio.



Heating, Piping & Air Conditioning, [7-44]
6 N. Michigan Ave., Chicago 2, Ill.

Please ask the manufacturers to send me more information about the equipment mentioned under the following reference numbers in Equipment Developments and Recent Trade Literature.

(Circle each number in which you are interested)

2643	2644	2645	2646	2647	2648	2649	2650	2651	2652
2653	2654	2655	2656	2657	2658	2659	2660	2661	2662
2663	2664	2665	2666	2667					
4727	4728	4729	4730	4731	4732	4733	4734	4735	4736
4737	4738	4739	4740	4741	4742	4743	4744	4745	4746
4747	4748	4749	4750	4751	4752	4753	4754	4755	

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YARWAY
STRAINERS

"Police the Pipelines"

YARWAY STRAINERS are *selling by the thousands* because they are better engineered for the service.

"*The Screen is the Thing*"—a high-grade, woven Monel wire screen that stops the dirt, lets fluids flow freely.

Then, too, purchasers like the *body finish—Cadmium plating inside and out* for protection against corrosion.

And last but not least, it is "*Easy to Clean*" having a steel blow-off bushing, precision machined with straight thread. Screen and bushing come out together—go back together, automatically aligning.

Six sizes, ½" to 2" for pressures up to 600 lb serve practically all strainer needs.

Sold by over 100 Mill Supply Houses. See your Supply House or write for Bulletin S-200.

YARNALL-WARING COMPANY
107 Mermaid Ave. PHILADELPHIA 18, PA.

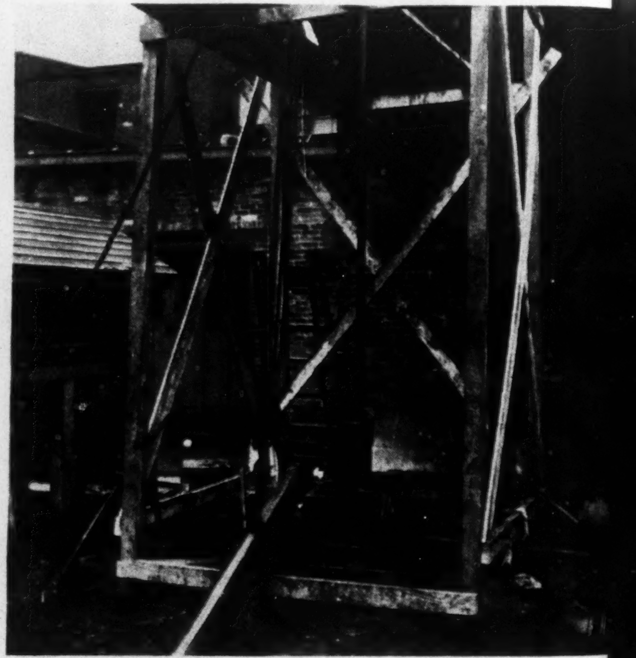
YARWAY STRAINERS

Propeller Fan Blades

No. 2647—The addition of several new sizes propeller fan blades to the "Airistocrat" line has be announced. To the standard series, a 27 deg pi has been added in the 10 and 12 in. diameters, a there is a new model in the pressure type fan ser According to the manufacturer, the most importa addition is in the "Autocrat" fan line, used in au mobile heaters and similar applications. The s range in this type has been extended with devel ment of 8 and 10 in. diameters, each with five blad A new 5½ in. five blade, made special for some ti is now listed as standard. Complete NEMA a NAFM performance ratings for these fans are ava able, as is information on the design of air impelli units.—Torrington Mfg. Co., 70 Franklin St., Torrin ton, Conn.

Wrought Iron Pipe

No. 2648—Wrought iron pipe is being used for t oil column in this water well at the City Ice & F Co., Dayton, Ohio. The column, inside which t pump shaft operates, consists of 5 ft lengths of inte nally threaded pipe connected with bronze couple



The oil column is a highly corrosive application a engineers selected wrought iron pipe in an effort t lower maintenance costs, according to the pipe man facturer.—A. M. Byers Co., Clark Bldg., Pittsburgh 2 Pa.

New Hot Dip Lead Alloy Coating Technique

No. 2649—New alloy and flux developments— well as improved techniques of application—no point the way to wide use of low tin content allo coatings to render metal products corrosion resistan according to a recent announcement. Corrosion re sistant properties of lead and its alloys have long been established and a wide variety of items may now be protected against corrosion by a new hot dip lead

Many plants discover

t costs less to use

COPPER TUBES

Copper tubes cost more by-the-foot, but in the experience of many plants, they cost less *by-the-year*.

Rustless and corrosion resistant, copper tubes are durable, retain smooth interiors that reduce pumping costs, are lighter in weight and provide (in the most commonly used sizes) important savings in installation cost. Longer tube lengths and the bending of tubes around obstructions reduce the number of fittings and joints required. Where elbows, tees or other connections are necessary, the solder-type fitting is used with a minimum of installation time. Important too, is the fact that soldered connections may be readily disassembled and reinstalled when plant alterations make it necessary to change the location of the pipe lines.

Present use of copper tubes is drastically curtailed by war demands. But it will pay you to look ahead to the day when this worthwhile piping is again generally available. Publication C-24, sent on request, describes industrial applications of Anaconda Copper Tubes.

4162

Types K and L tubes made in nominal sizes, from 1/8" up to and including 12". Type O tubes made in nominal sizes from 3" to 12" inclusive.

ANACONDA TYPE·L
ANACONDA TYPE·K
ANACONDA TYPE·O

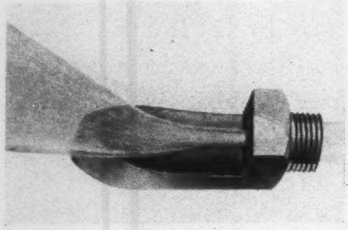
ANACONDA

Anaconda Copper Tubes

THE AMERICAN BRASS COMPANY—General Offices: Waterbury 88, Connecticut

idiary of Anaconda Copper Mining Company • *In Canada:* ANACONDA AMERICAN BRASS LTD., *New Toronto, Ontario* alloy coating technique. These items include radiators, oil containers, air conditioning ducts, heater coils, gasoline tanks, and many others. The actual coating operation of the articles after the requisite cleaning, pickling, and fluxing have been done, consists of immersion of the article in the molten metal with sufficient agitation to assist in the freeing of adhering flux. The coated articles may be cooled in air, after dipping, or they may be quenched in oil, the latter technique resulting in more even and finer grained coatings.—National Lead Co., 111 Broadway, New York 6, N. Y.

Industrial Spray Nozzle



No. 2650—The "Flatjet" spray nozzle illustrated has been designed for a wide variety of industrial applications "wherever a sharp, flat, hard hitting spray is needed." It is used for stone and gravel washing, industrial washing and degreasing, descaling operations, and various chemical process spraying operations. Built without cores, vanes or other obstructions, it depends solely on its design to produce the desired spray pattern. Standard units are of brass, steel, or stainless steel one piece construction, but the nozzles may also be made of other materials as the needs

the applications dictate. As an example of the si

available, in spraying water at 40 psi pressure

choice may be made of 20 different nozzles ranging

capacity and spray angle from 1 gpm and a 15 d

angle, to 20 gpm and a 35 deg angle. These nozz

may be used with water, brine, oil, and liquids

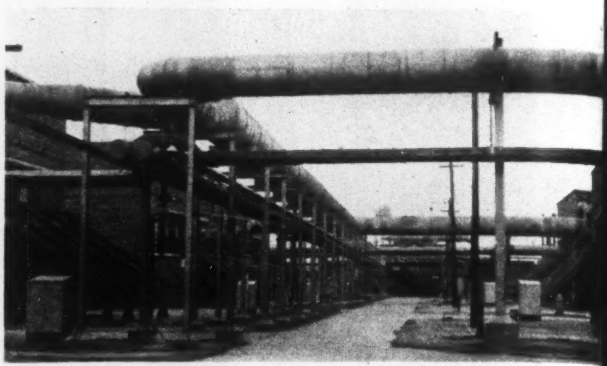
similar viscosities.—Spraying Systems Co., 4031

Lake St., Chicago 24, Ill.

Duct Work at Ordnance Plant

No. 2651—Pictured here is a portion of the 1

miles of duct work fabricated and installed by Carri



Corp., Syracuse, N. Y., for use in connection wi

solvent recovery at an ordnance works. The duc

range in size from 22 to 38 in. in diameter.

Send for This Folder!

GIVES YOU TIMELY FACTS
ON STOKER SALES TODAY

You will find this folder interesting — and valuable — because it proves today's greater-than-ever market for Class "A" stokers in the apartment-commercial-industrial fields. Take advantage of your double opportunity to help speed the government's vital fuel conservation program . . . and to establish your own permanent, profitable stoker business. Send for this timely folder today; get set with Freeman now!

FREEMAN . . first choice of Ameri
foremost heating engineers . . . i
pioneer of the stoker industry,
one of the leaders in national
volume!

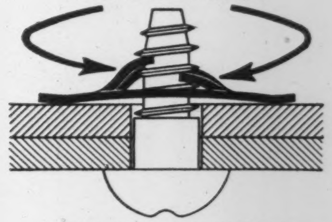
Look at the Speed Nuts*

[PATENTED]

SPRING-TENSION LOCKING ACTION!

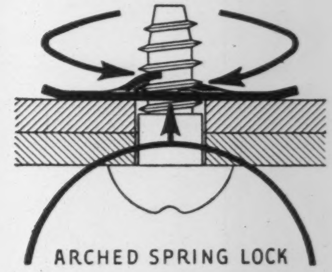
FASTEST THING IN FASTENINGS!

ARCHED PRONGS



STARTING POSITION

INWARD THREAD LOCK



ARCHED SPRING LOCK
DOUBLE-LOCKED POSITION

An arched spring lock and an inward thread lock are basic features found only in Speed Nuts. The ingenious design that sets up these two forces accomplishes more than you'd realize unless you checked into it more closely.

Spring steel Speed Nuts have a base which is well arched, and arched prongs that are formed to follow the helical pitch of standard screw threads. As the screw is tightened, the arch is reduced, forcing the prongs deeper into the root of the screw threads. This provides a double spring-tension lock that prevents vibration loosening.

Speed Nuts eliminate the use of lock washers and are 50% to 75% lighter in weight than other self-locking nuts. They are faster to apply and drastically reduce assembly costs. Double your use of Speed Nuts and you will double your assembly savings. Write for literature.

TINNERMAN PRODUCTS, INC.
2018 FULTON ROAD • CLEVELAND 13, OHIO
In Canada . . . Wallace Barnes Co., Ltd., Hamilton, Ontario
In England . . . Simmonds Aerocessories, Ltd., London

The lightest weight self-locking nuts ever produced!

PETRO
REG. U.S. PAT. OFF

OIL BURNING SYSTEMS

Petro Class A (Industrial) Equipment is currently available under W.P.B. regulations and ratings.

Petro equipment includes:

DOMESTIC "CONVERSION" BURNERS
1 to 6 gal. per hour

LARGER "LIGHT (No. 3) OIL" BURNERS
general application type
6 to 18 gal. oil per hour

COMBINATION BURNER-GENERATOR UNITS
both steel and C. I. sectional boilers; forced warm air units; and instantaneous water heaters.

INDUSTRIAL OIL BURNERS
Manual - Semi Auto - and Automatic* for either un-heated or pre-heated industrial oils, up to 145 g.p.h. Built-in motor or belt drive.

When pre-heated oils are burned the Petro Thermal Viscosity system insures consistent maximum combustion efficiency at all firing stages, automatically and reliably.

Petro Engineering co-operation is still available. Research-development is active. When your post-war activities start, Petro will be ready for you.

OIL IS AMMUNITION
USE IT WISELY

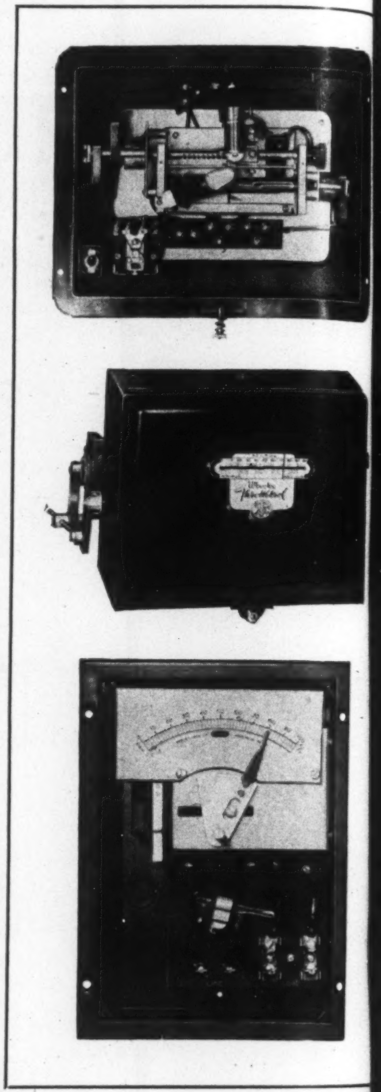
Full data on Petro Industrial Burners are in our Catalog—see Sweet's or Domestic Engineering Catalog Files—or we will gladly send copies on request.

PETROLEUM HEAT AND POWER COMPANY

Makers of Good Oil Burning Equipment Since 1903

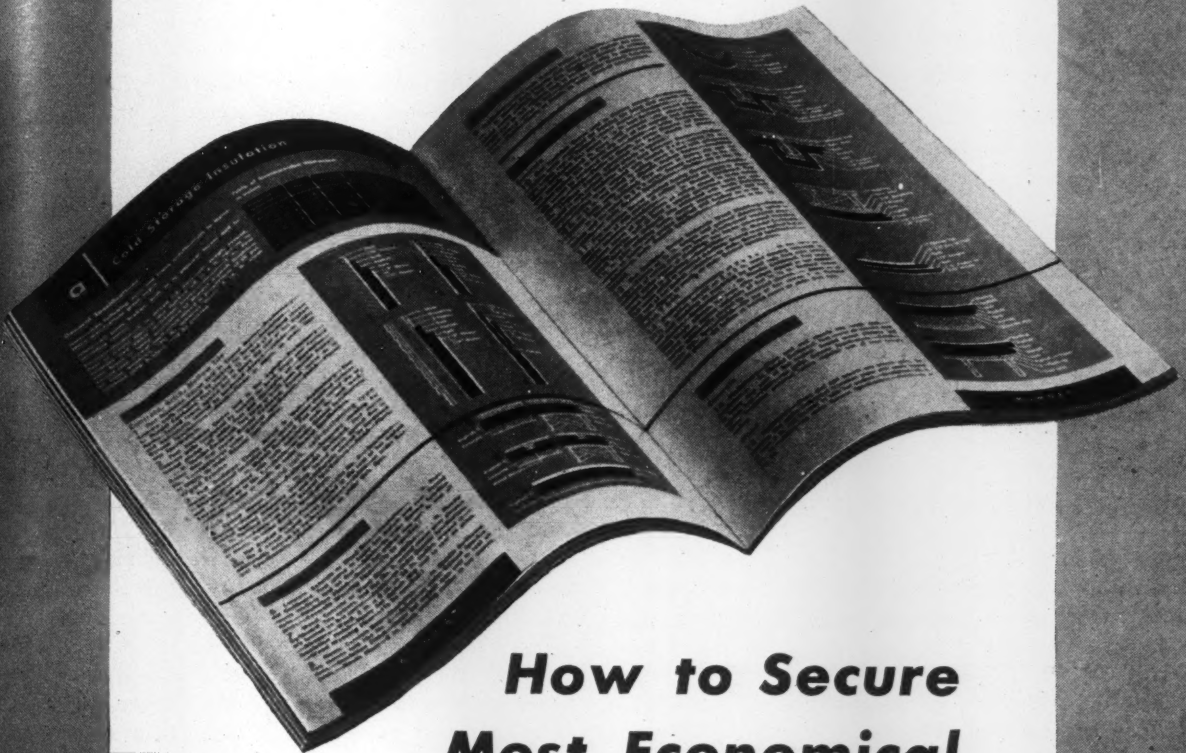
STAMFORD . CONNECTICUT

New Industrial Controllers



No. 2652—Addition of three new instruments manufacturer's line of industrial controllers, and finements in a fourth, were announced last mo Two of the new instruments, designated "Inputrols," are designed to control input of power, heat, or flow of liquids or gases to any process equipment. The third, a "Throttltrol," is designed to correct variations in heat requirements of furnaces and process equipment by positioning a valve in the fuel line. The "Rheotrol," a manually operated controller for regulating input to electrically operated furnaces, ovens, heaters, kilns, etc., has been refined and is now offered in a flush mounted case. The "Inputrols" are offered in automatic and manually set models. The basic elements of the instruments are a mercury switch mounted on a carriage, a rotating horizont cylindrical cam driven by a small synchronous moto and a spiral on which the mercury switch carriage mounted. In the automatic model, which is used w a pyrometer, the spiral is turned automatically position the mercury switch carriage at the prop point along the rotating cam. In the manual mode the spiral is set by hand to the input point desired b the equipment operator. The scale is illuminated an is calibrated in terms of per cent of maximum inpu If its pointer is at 60, for example, the instrument mercury switch will be in its "on" position 60 per cen of the time, or 36 seconds of each minute. Th "Throttltrol" is essentially a simplified valve positio ing device designed for use with any control instr ment having a high and low contact. It corrects var ations in heat requirements due to changes in loa control settings, air and fuel pressure, Btu values, a combustion efficiency. At a given setting, it will pe mit a fuel valve to open only the desired distan when the two position control instrument is in i

FREE *The Mundet Insulation Manual is published in brief, factual form in handy 8½x11 filing size. Contents include Cork specifications, drawings and convenient heat loss chart for use in determining the thickness of corkboard needed for specific temperatures. Write now for your copy.*



How to Secure Most Economical Control of Temperature

Be sure that ALL rooms and pipe lines are *adequately* insulated for controlled temperature applications: 1st. By specifying the most efficient low temperature insulation. 2nd. By installing it in sufficient quantities for *full* protection.

CORK is so efficient in insulating properties that its performance has long been the accepted standard for low temperature requirements. One cubic inch of Cork contains approximately 200 million cells, each cell hermetically sealed and holding stationary air. This remarkable structure provides a highly effective barrier to heat transfer, conserving refrigeration to the most practical limits. Through 79 years experience as Cork specialists, we are able to insure and preserve Cork's natural advantages in Mundet insulating products.

Mundet specialists in principal cities offer responsible assistance to users of low temperature, including complete installation. Let us help you secure most profitable operation of low temperature for present and postwar requirements. Mundet Cork Corporation, Insulation Division, 65 South 11th Street, Brooklyn 11, N. Y.

MUNDET
CORK INSULATION

CONSERVES LOW TEMPERATURE

"on" position. In this manner, it permits an even and constant flow of fuel to the burner and minimizes the danger of overshooting.—Wheelco Instruments Co., Harrison and Peoria Sts., Chicago 7, Ill.

Heating Installation for Thawing Ore Cars

No. 2653—An ore car thawing plant constructed by Rust Furnace Co., Pittsburgh, Pa., for Carnegie Illinois Steel Corp., successfully completed its test period during the latter part of the past winter, according to a report made public last month. Purpose of the plant is to overcome the winter-time condition in which ore from the lakes becomes soaked with moisture and freezes in the cars so that it will not run out when dumped.

This condition has been met by crude methods in the past, which have included holding gas jets against the cars, building wood fires under them, and placing them in sheds under steam for hours—all wasteful of time and labor, and incidentally not contributing to the life of the cars. Accordingly, an automatically operated plant for the specific purpose of surface thawing ore cars, so as to permit the ore to fall free of the car when unloaded by a dumper, was planned.

Erected and put in operation in the latter part of the winter, this plant consists of a building with a capacity of two 90 ton ore cars on a track which runs through it. An additional track is provided for an electrically operated pusher locomotive. Housed on a second floor are combustion units for producing hot gas for recirculation and application against the cars.

The arrangement includes the thaw chamber, w the cars stand; two double chamber furnaces w rated capacity of 10,000,000 Btu per hr each; fuel oil fired burners; combustion air fan; fuel s ply line; steam supply line for fuel atomizing; motor driven air recirculating fan—together with necessary ducts, passages, and controls.

The thawing operation consists of circulating and gases from the combustion chamber through closed air circuit, comprising the thaw chamber, f nace, fan and interconnecting ducts, the air be alternately heated and cooled in its passage.

In operation, two loaded cars are positioned in thaw chamber, either being drawn in by locomot if first in line, or moved by the pusher locomotive

After the pusher locomotive withdraws, its ope tor, who has complete charge of the thaw chamb electric control, automatically sets derailing devi on the rails, and also a red light signal, blocki traffic in and out of the chamber. The impulse fr the same control sets up a circuit to close the door

The closing of the doors automatically puts in oper tion the furnaces and air recirculating fans. An a justable cycle timer regulates the thawing cycle two periods gaged by the operator according to hardness of freeze. The periods are approximate (1) 10 min flash heating in excess of 500 F, (2) c back to between 200 and 250 F for five to 10 min base heating and soaking. At the end of this cyc the operator opens the doors, this electrically-co trolled action causing the fuel shutoff valve to clo

Our Mark of Merit.. Your Sign of Servic

. . . more than ever you'll want the things it stands f

LEADERS IN VALUE·SERVICE
Schaible
PROGRESS·DEPENDABILITY

VALUE: Higher quality at attractive price means better value . . . better profits. Schaible Values are never excelled . . . rarely matched. True in war or peace, Schaible products are leaders in better value.

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DEPENDABILITY: Compan character in performance duty . . . to the industry an every customer . . . are of fir importance to Schaible. O reward is the rapidly growin dependence on and confiden in us by the trade.

The Schaible Company • Cincinnati 4, Ohio
MAKERS OF QUALITY BRASS GOODS STOCKED BY LEADING WHOLESALERS EVERYWHE

SAVING FUEL IS OUR BUSINESS

THE IRON FIREMAN

Sprague Warner-Kenny, owners of the famous Richelieu brand of quality foods, supplies 60,000 grocers. Its head, Mr. Nathan Cummings, has achieved phenomenal success through his ability not only to build a progressing organization, but also through his skill in eliminating waste. His selection of Iron Fireman firing is a typical example of his ingenuity.

$12,714 a Year Saved for RICHELIEU

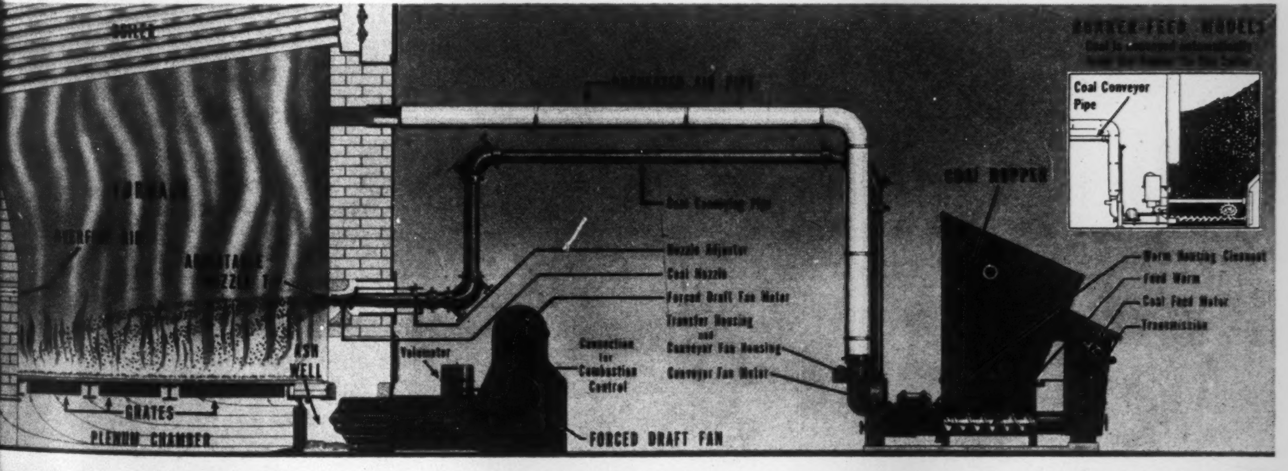
It's always good business to save fuel. Now it is a good way to serve our country, too. Fuel saving is a wartime "must." So there is a patriotic thrill today for plant ners and engineers who can make a genuine reduction fuel consumption. Especially when lower costs are ccompanied by improvements in boiler room efficiency. This happened at the Chicago plant of Sprague Warner-nny, home of the famous Richelieu brand of quality ods. Steam formerly cost 62c per thousand lbs. After stalling Iron Fireman it cost only 26¼c—58% saving. Fuel and labor savings amount to $12,714 a year! America is a stronger nation because of the job Iron reman is doing in the Sprague Warner-Kenny plant. America would be still stronger if a way could be found to make *your* plant more efficient. Perhaps it can be done. Will you give us a chance to study *your* plant at *our* risk?

IRON FIREMAN

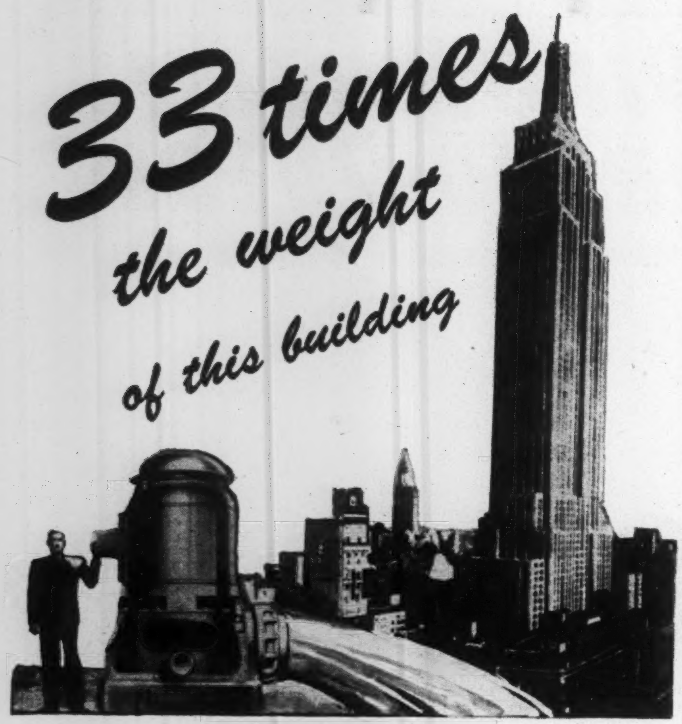
COAL STOKERS

THE MACHINE THAT MADE COAL AN AUTOMATIC FUEL

Our nationwide organization of qualified factory representatives and dealers is at your service. For a free survey showing what Iron Fireman firing can do in your building or plant, write Iron Fireman Manufacturing Company, 3081 W. 106th St., Cleveland 11, Ohio.


BOILER
FURNACE
ADJUSTABLE NOZZLE TIP
ASH WELL
GRATES
PLENUM CHAMBER
Volumeter
Connection for Combustion Control
FORCED DRAFT FAN
Coal Conveying Pipe
Nozzle Adjuster
Coal Nozzle
Forced Draft Fan Motor
Transfer Housing and Conveyor Fan Housing
Conveyor Fan Motor
COAL HOPPER
Worm Housing Cleanout
Feed Worm
Coal Feed Motor
Transmission
BUNKER-FEED MODELS
Coal Conveyor Pipe

ON FIREMAN PNEUMATIC SPREADER STOKER. The Iron Fireman Pneumatic Spreader meters steam size coal from the hopper or n coal bunker to a transfer housing where the coal is picked up by the Pneumatic Conveyor and delivered to the furnace. The veyor nozzle accurately spreads the larger particles of coal over the entire grate in a shallow uniform bed. The preheated fines n rapidly in suspension, greatly reducing the cinder carry-over and materially improving the combustion efficiency and responsives as compared with other stokers which do not preheat the fuel.



LIFTING

10 MILLION TONS

of water annually

A good pump has to take a lot of punishment. For instance, take an average size Peerless Pump producing 5000 gallons of water per minute, lifting it from a deep well, 75 feet straight up. That's a lift of over 1200 tons per hour. In one year this pump lifts 10,957,000 tons. That's a lot of lifting. No wonder so many cheaply-built pumps fail. It takes a Peerless to stand up under such a load, year after year. Peerless precision is worth the effort. Peerless stamina is insurance of economical pump life.

10 TO 220,000 G.P.M.

Peerless Pumps

TURBINE • HI-LIFT • HYDRO-FOIL

PEERLESS PUMP DIVISION, Food Machinery Corporation
301 W. Ave. 26, Los Angeles 31, California
1250 Camden Ave., S.W. Canton 6, Ohio
OTHER FACTORIES: San Jose 5, Fresno 16, Calif.

and stop the air recirculating fan. A pilot flam left burning to initiate the next combustion cycle.

The two thawed cars are then drawn out by dinkey and spotted on the car dumper platen. F their surface thawed ore is dumped into electric drawn transfer cars.

New Type Glass Fiber Insulation

No. 2654—Glass fibers with a diameter measure ten-thousandths of an inch, and weighing only one-hundredths of a pound per square foot w bound with a thermosetting resin and formed ½ in. thick sheets, are being used in the cabins flight decks of certain types of U. S. war planes provide insulation against the extreme cold of stratosphere and to deaden fatigue-causing sou The fibrous glass sheets are incombustible and, cording to the manufacturer, are the lightest inorg material commercially available for the soundpro and insulation of planes. Another important facto that the sheets gain less than 1 per cent of their weight from moisture in the air, when subjected temperatures of 125 F and to 90 per cent relat humidity.—Owens-Corning Fiberglas Corp., Nich Bldg., Toledo, Ohio.

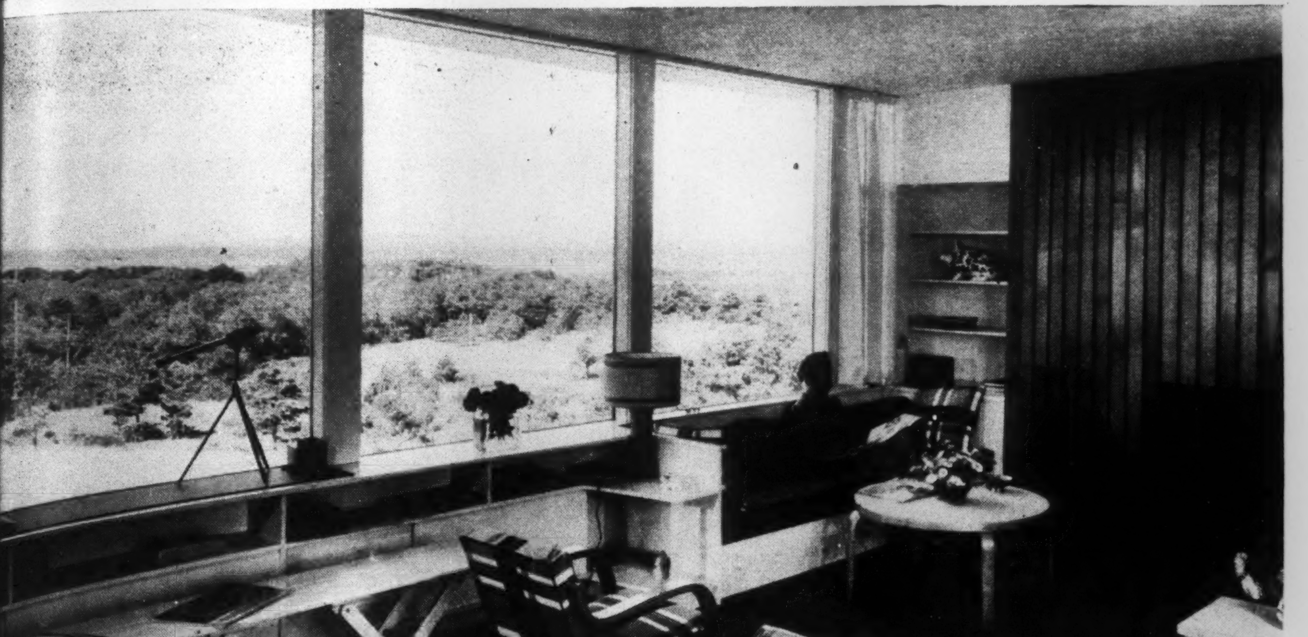
New Line of Flow Meters

No. 2655—A new series of "Rotameters" announ recently are of the indicating area meter type in si from ⅛ to 3 in., with both free and guided floats. The floats may be viscosity or density compensated and the metering tubes are of extra heavy "Pyrex" glass formed on mandrels, annealed, polariscope inspected, and check-gaged by precision ball tests. Features of the instruments include spring stop floats to prevent damage by sudden surges of the liquid; high pressure stuffing boxes; white backed metering tube for easy reading; interchangeable calibration scales; and a constant tension guide rod anchored in the ends of the glass tube which, according to the manufacturer, makes possible more accurate centering, as the tension is unchanged by stuffing box adjustments.—Cochrane Corp., 3131 N. 17th St., Philadelphia 32, Pa.

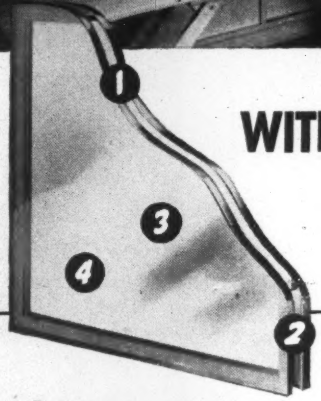
Manually Operated Tube Bender

No. 2656**—A new manually operated tube bende which produces 900 to 1000 bends per hr will hand nonferrous tubing from ⅜ to 1¼ in. OD, producin from one to 10 different bends in a single 9 ft lengt of tubing. Designed for aircraft applications, th bender can make bends "to any specified degree o angle up to 180 deg, and at any radial angle." Th machine cam arrangement and automatic stops a adjusted according to specifications on the job tick and the machine is ready for production. Standar bend, follow and clamp blocks are adaptable to th machine—which is known as the "Bendmaster"—an in special cases the machine can be furnished to f any bend blocks.—Leonard Precision Products C 1100 Larson Ave., Garden Grove, Calif.

ARGER WINDOWS WITH MINIMUM HEAT LOSSES



Imogene Wolcott house. *Carl Koch: Architect.*



WITH *Thermopane*

THE INSULATING WINDOWPANE

4 important features of Thermopane

❶ **INSULATING AIR SPACE.** The layer of air inside the Thermopane units is scientifically cleaned, dried and hermetically-sealed at the factory. This sealed-in air gives Thermopane its high insulating efficiency.

❷ **BONDERMETIC SEAL.** This patented, weatherproof, metal-to-glass seal bonds the two panes of glass into one unit to prevent dirt and moisture from entering the air space.

❸ **CLEAR VISION.** The dry air is sealed in with the patented bond to prevent frost or condensation from forming on the inner surfaces of the panes of glass.

❹ **ONLY TWO SURFACES TO CLEAN.** The glass surfaces inside a unit are specially cleaned at the factory . . . and stay clean!

Welcome news for the Heating and Ventilating Industry! THERMOPANE—the new prefabricated insulating windowpane made by Libbey·Owens·Ford—makes larger window areas possible without excessive heat loss penalties.

This major development in window construction widens the trend toward larger window areas . . . tremendously increasing the input of natural daylight illumination. It is the first successful windowpane ever made with built-in insulation. THERMOPANE consists of two or more panes of glass, separated by an insulating air space, and sealed around the edges at the factory. It comes as a complete unit . . . is installed in a sash like ordinary window glass, except that the rabbeting is grooved to accommodate its slightly greater thickness.

In planning your postwar homes, consider the advantages of THERMOPANE. See your local L·O·F Glass Distributor about this *all-year, all-weather glazing unit* for homes, offices and factories. Or write Libbey·Owens·Ford Glass Company, 6374 Nicholas Building, Toledo 3, Ohio.

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L O F

LIBBEY·OWENS·FORD
***a Great Name in* GLASS**

WHEREVER VISION IS IMPORTANT
USE L·O·F *Polished Plate* GLASS

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WARTIME EXPERIENCE

points to

POSTWAR PERFECTION

Since automatic controls are essential to modern, mechanized warfare, the greater part of our production is devoted to turning out vitally necessary precision built equipment.

The specialized skills used to hasten the day of Victory will also serve after the peace is won. When that day comes, knowledge gained from wartime experience will be used to good advantage.

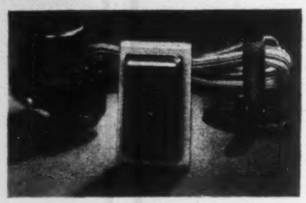
Automatic controls will give the American of tomorrow even higher standards of living and production efficiency than those now enjoyed. We will be ready to maintain our reputation as pioneers and leaders in this field.

B-60 Four New Features

Write for Catalog 52.

1. Compact, secure, tamper-proof cover.
2. Integral pilot valve assembly. Accessible.
3. Strong bodies; hi-tensile iron. High seating pressure and capacities.
4. Securely-locked binding posts. Terminals easily connected.

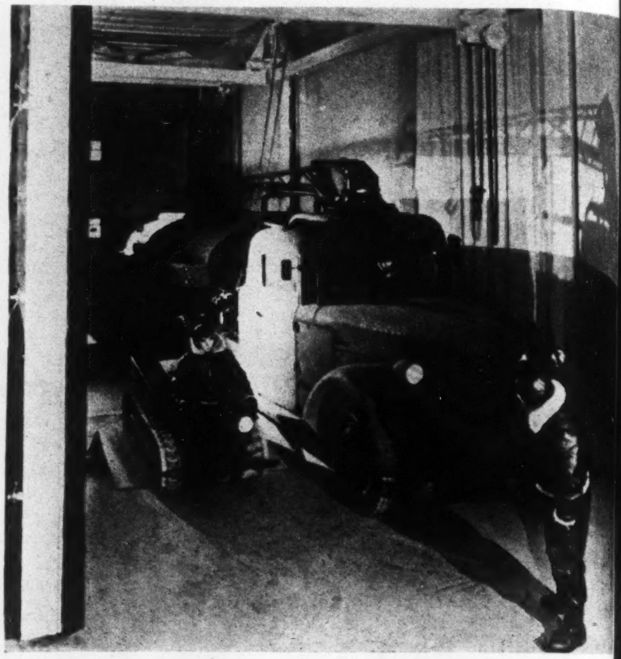
B-60 Gas Controls equipped with heavy-duty pilot generator for liquified petroleum gases. Self-operating, on current from pilot burner thermocouple generator. All parts sealed. B-60 available in Package Set, with Trimtherm thermostat, 30 ft. wire, and generator. Complete, packaged Heat Control. (shown at right)



GENERAL CONTROLS
801 ALLEN AVENUE GLENDALE 1, CALIF.
Branches: Boston • New York Detroit • Chicago • Dallas
Philadelphia • Cleveland • Atlanta • Denver • San Francisco

Refrigerated Test Room

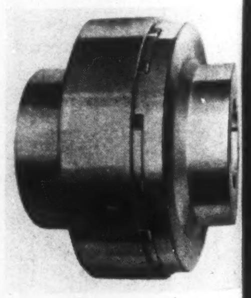
No. 2657—A "refrigerator" large enough to put a entire fuel servicing truck "on ice" is in use at Wrigh field to test the ability of air forces equipment to tak the punishment of arctic weather. The illustratio shows a small tractor and a large fuel servicing truc emerging from the test chamber which is capable o carrying temperatures lower than 70 F below zer



The 16 in. double doors weigh 4½ tons and are electrically controlled. Observation windows contain eight thicknesses of glass to prevent frosting, which would obscure vision.—York Corp., Roosevelt Ave, York, Pa.

Flexible Coupling

No. 2658—Protection "that secures operators against the catching of clothing, or incautious handling" is included in the new "L-R Type C" shrouded flexible coupling. This coupling has an outside steel collar which holds the load cushions in place, and an extension of the collar encircles the coupling, safeguarding material and fingers from the heads of the bolts that hold the load cushion retainer. These couplings are designed for heavy duty services, and have free floating load cushions between the jaws held in position between an inside steel sleeve and the removable steel collar. Cushions of various materials are used, adapted to the particular service on which the coupling is to be used.—Lovejoy Flexible Coupling Co., 5024 W. Lake St., Chicago 44, Ill.



Testing Hardness of Sheet Metal Parts

No. 2659—A mechanical device for testing and automatically certifying the hardness of sheet metal

FOR A PRACTICAL JOB • AND ONE THAT STAYS RIGHT

—MUELLER BRASS CO—PORT HURON MICH—STREAMLINE—HARD—GOVT—
VT—TYPE M—
—MUELLER BRASS CO—POR
MB Co
MBCo
MBCo

STREAMLINE

TRADE MARK REG. U. S. PAT. OFFICE

COPPER PIPE AND SOLDER FITTINGS

The flow area through STREAMLINE Copper Pipe and Fittings is continuously uniform. The material cannot rust and it offers high resistance to clogging. STREAMLINE Copper Pipe and Fittings provide a valuable security factor against leakage, particularly in concealed work where a leak may cause extensive damage to walls, ceilings and furnishings, and entail heavy expense to repair.

STREAMLINE Copper Pipe and Solder Fittings are the most practical materials a plumber or steamfitter can use for water, steam or vapor systems. STREAMLINE Copper Pipe is much lighter than ferrous piping and there is a great deal less hard work in installing. It requires less space for storing, hauling and erecting...and once properly put in, there will be no expensive "come-backs". The job is right and stays right.

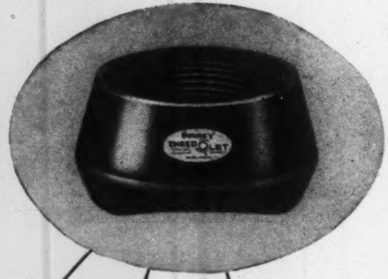
STREAMLINE Copper Pipe and Fittings are at present used 100% for war purposes, but it is not too early to plan again for their peacetime use in the near future when they will again be available.

NEW • REMODELING •

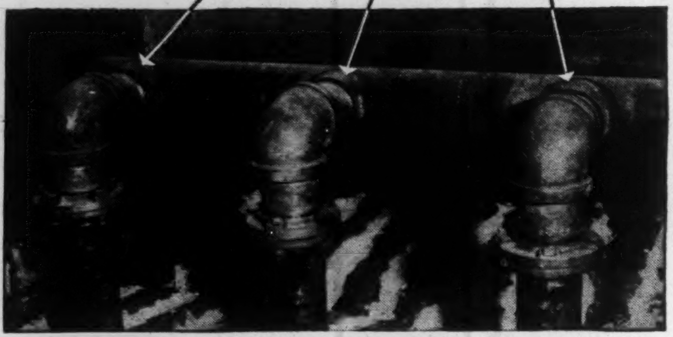
BEST FOR HEATING • PLUMBING AND AIR CONDITIONING •

STREAMLINE
PIPE AND FITTINGS DIVISION
MUELLER BRASS CO.
PORT HURON, MICHIGAN

WeldOlets are available in three types—with Welding Outlet, Threaded Outlet (illustrated at right) and Socket Outlet. Stock fittings are drop forged steel. Also available in Monel, Everdur, Toncan Iron, Wrought Iron, etc.



Here's the simple way to install branch pipe outlets



● On this piping installation the three branch pipe outlets were installed quickly and easily by the WeldOlet method. The elimination of any templates or the need for any cutting, forming or fitting, speeded and simplified the installation.

These drop forged fittings reinforce the junction so that the original strength of the main pipe is maintained. In addition, the extra large funnel-shaped opening, in the fittings where they join the pipe, cuts pressure loss and reduces turbulence and friction. The WeldOlet method is speedy and low in cost for both size to size or reducing branch pipe outlets. Size to size and reducing sizes are available from ¼" to 12". For complete information write for Branch Pipe Outlet Catalog WT31.

Forged Fittings Division

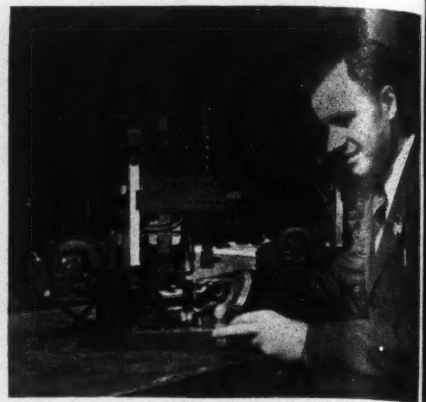
Bonney Forge & Tool Works • 350 Green St. • Allentown, Pa.

WELDOLETS

WELDING OUTLET - THREADED OUTLET - SOCKET OUTLET

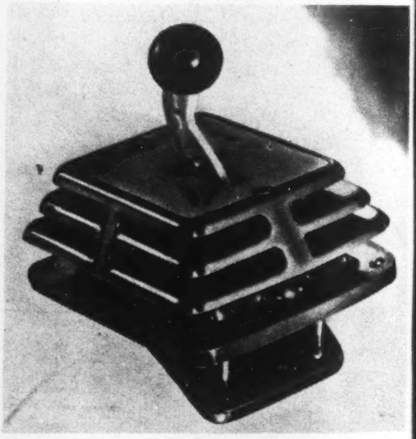
For Welded Branch Pipe Outlets

parts has been designed and built by Adolph Vlcek, Jr., of the inspection department of the Glenn L. Martin Co., Baltimore, Md., and has already saved over 1000 man hours. Known as a "hardness certifier," the machine was invented not primarily as a time saver, but as a means of increasing accuracy in certifying the hardness of aluminum alloy parts. The machine is set for the thickness of the material and the minimum satisfactory hardness. Parts are then fed under the indentor point of the unit which moves up and down at the rate of 43 times per min. If the part measures up to the specified hardness, an electrically operated plunger automatically stamps it with both the inspector's and the hardness stamp. If it is too soft, the plunger remains inactive and the part cannot be certified. The entire operation is thus fully automatic.



Control Assemblies Molded of Plastic

No. 2660—Heat and air vent control assemblies for use in bombers are now molded of light weight "Tenite" plastic. According to the manufacturer, the control withstands temperatures from 40 F below zero to 180 F above zero. The control is riveted to the air ducts, "which operation called for a tough, high impact material." These control assemblies are molded by Reynolds Molded Plastics, Cambridge, Ohio, for North American Aviation, Inc. The plastic is manufactured by Tennessee Eastman Corp., Kingsport, Tenn.



Cleaning Boiler Tubes

No. 2661**—Regular cleaning of boiler tubes with the help of modern power brushing contributes greatly to efficiency and economy of boiler operation, according to a recent announcement. Power brushing in the form of six steel-bristled brushing sections or wheels, spinning as a unit through the tubes, makes quick work of the job of removing carbon and soot, according to a chemical manufacturing plant which has the method in operation. The equipment consists of a

Boilermaker's pride!

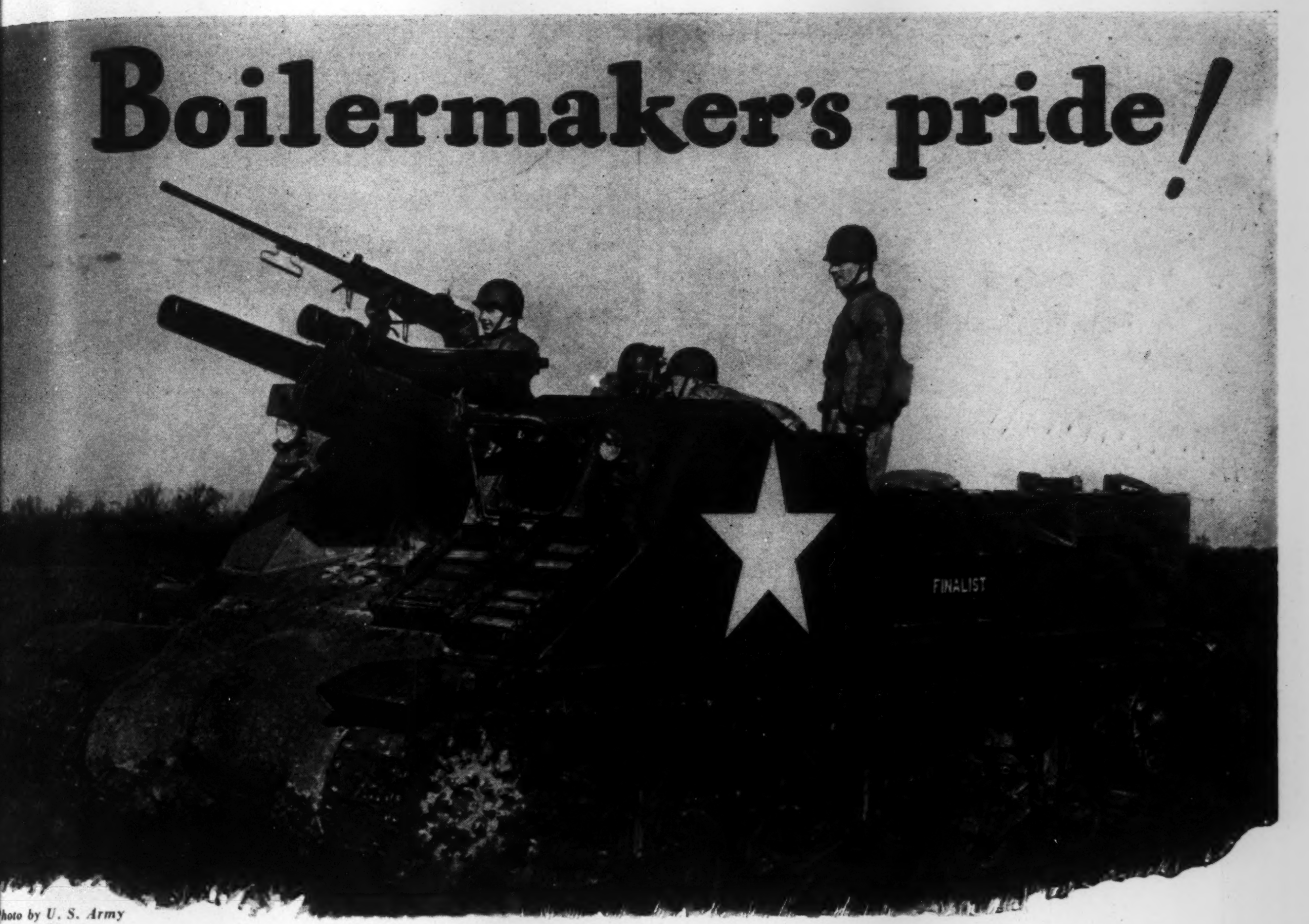


Photo by U. S. Army Signal Corps

TANK SMASHER BY FITZGIBBONS is an alternative title for this picture. It shows one of Uncle Sam's M-7 Tank Destroyers, whose 105 mm. gun is calculated to turn the toughest enemy tank into scrap in a few seconds. The chassis and assembly work in large numbers of these units is a Fitzgibbons job. We're a bit proud of it.

After all, it is something of an honor to be handed a job like the building of these Tank Destroyers. Fitzgibbons was selected because of the excellent record of our men and our shops in the production of General Sherman tanks. We feel as though we had a medal pinned on us. And we're more than determined to keep on earning the distinction.

It's not such a jump from welded steel boilers to welded steel armored fighting equipment. Nor will it be such a big jump back again to steel boilers. And those Fitzgibbons boilers will be even better in engineering and workmanship, because of the broadening experience of Fitzgibbons wartime production.

A STAR HAS BEEN ADDED to Fitzgibbons' Army-Navy "E" flag, evidence of continued excellence in wartime production.

ARMY E NAVY

MOST ECONOMICAL IN FUEL · THE FITZGIBBONS BOILER · 1886

FITZGIBBONS BOILER COMPANY, INC. • 101 Park Ave., N. Y. 17, N. Y.

Works: OSWEGO, N. Y. • *Branches in Principal Cities*

BUY U. S. WAR BONDS and STAMPS

FITZGIBBONS

STEEL HEATING BOILERS SINCE 1886

KENNARD
FINNED COILS

IMPORTANT
ANNOUNCEMENT

COPPER
FINNED COILS
FOR STEAM, AIR CONDITIONING
AND REFRIGERATION

Now in Production

TWO TO THREE WEEKS DELIVERY

STEAM COILS
Copper Tubes, Copper Fins

AIR CONDITIONING & REFRIGERATION COILS
Copper Tubes, Aluminum or Copper Fins

CONTRACTORS AND MANUFACTURERS send us your specifications. We will quote and specify delivery date.

We are now producing Non-Freeze Coils of the "tube within a tube" type.

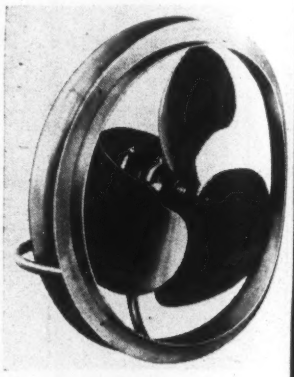
Cooling FINNED COILS Heating

SAM KENNARD INC.
4821 Easton Ave. St Louis 13, Mo.

power driven flexible shaft on which is mounted six 3 in. brushing sections packed with crimped wire. The shaft is run through the tubes and rotates at 1750 rpm. The wire ends which comprise the working face of the brushes "clear away the carbon and soot and leave the tube surfaces clean and smooth."—Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, Ohio.

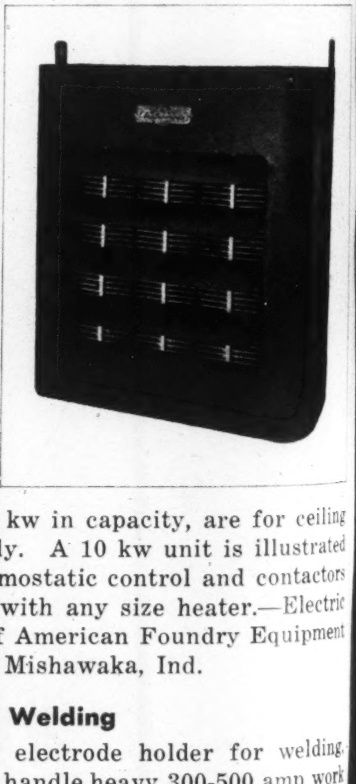
Improved Propeller Fans

No. 2662—Propeller fans of improved design that, says the manufacturer, are "ideal for use where quiet is necessary" have a streamlined ring that permits smooth flow of air with minimum turbulence and noise, a fully enclosed motor that is resilient mounted to reduce vibration, and low speeds that further aid quiet operation. Belt driven models have a variable pitch pulley for simple speed adjustment, and an adjustable base provides convenient means of regulating belt tension. The units are easily installed in a wall, a window, or a panel by means of a heavy gage steel ring mounting.—Utility Fan Corp., 4851 S. Alameda St., Los Angeles 11, Calif.



Electric Unit Heaters

No. 2663—Fourteen new standard electric unit heater models announced recently incorporate patented one piece finned aluminum elements as used in the complete "Electromode" line, with new refinements in enclosure and deflector design. No hot or incandescent wires are exposed, and oxidation and deterioration are prevented, according to the manufacturer. Six models ranging from 1.5 kw to 7.5 kw can be used as portable heaters, or arranged for ceiling and wall suspension. The eight larger models, from 10 to 60 kw in capacity, are for ceiling or wall suspension only. A 10 kw unit is illustrated here. Automatic thermostatic control and contactors are available for use with any size heater.—Electric Air Heater Co., Div. of American Foundry Equipment Co., 619 S. Byrkit St., Mishawaka, Ind.



Electrode Holder for Welding

No. 2664**—A new electrode holder for welding, made in two models to handle heavy 300-500 amp work and for lighter 200 amp jobs is molded of a high heat

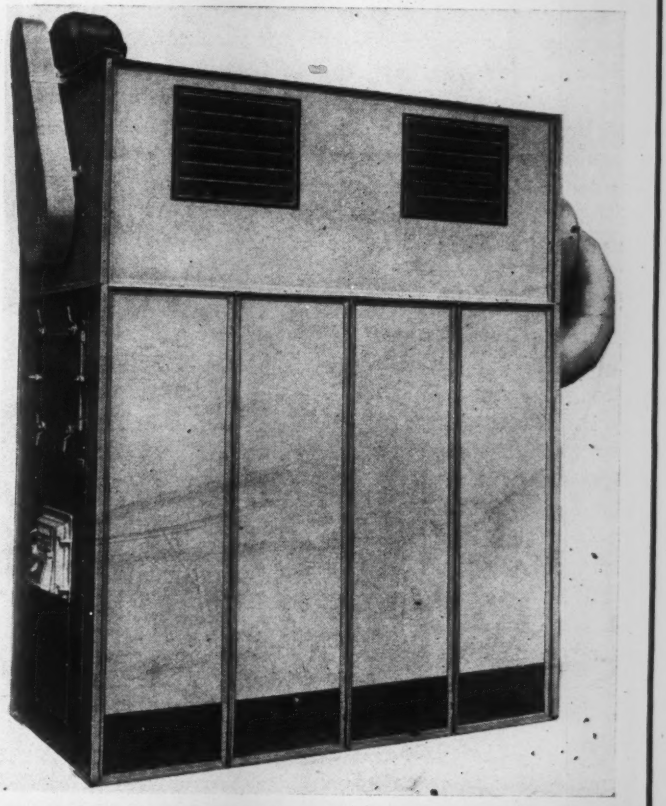
NATIONAL CHAMPION

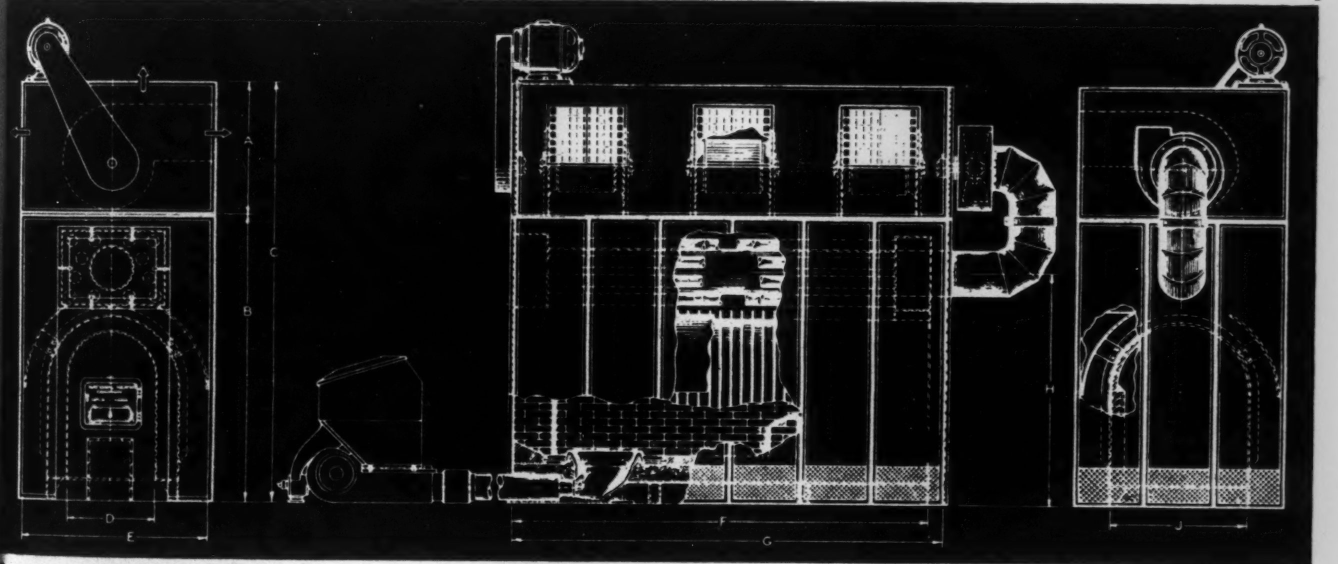
STEEL SPACE HEATERS

640,000 to 4,000,000 B. T. U.

Oil-Stoker-Gas-
or Hand Fired

Designed in accordance with sound, modern engineering, and a background of fifty years of successful heating experience.





DIMENSION AND PERFORMANCE DATA

HEATER NUMBER	DIMENSIONS IN INCHES									B.T.U. OUTPUT PER HOUR	C.F.M. MAX.	SQ. FT. GRATE	TUBES		THICKNESS OF METAL			SQ FT. HEATING SURFACE	APPROX. WEIGHT	BLOWER MAXIMUM	MOTOR MAX.
	A	B	C	D	E	F	G	H	J				NO.	DIA.	BODY	TUBES	CASING				
300	33	84	117	22	48	66	72	68.75	30	640,000	8,200	6.5	2	8"	1/4" R.	12GA.	20GA.	320	3,200	16" TWIN	3H.P.
350	39	84	123	22	48	90	96	68.75	30	860,000	11,000	8.0	2	8	1/4" R.	12GA.	20GA.	430	4,100	18" TWIN	5H.P.
500	42	96	138	30	65	91	96	77.5	45	1,215,000	18,150	12.00	10	4	1/4" R.	3/16" R.	20GA.	600	8,300	21" TWIN	7.5H.P.
550	48	96	144	30	65	139	144	77.5	45	2,000,000	32,000	14.70	12	4	1/4" R.	3/16" R.	20GA.	844	10,280	24" TRIPLE	10H.P.
600	54	96	150	30	71	161	166	77.5	51	2,500,000	45,000	16.00	16	4	1/4" R.	3/16" R.	20GA.	1421	15,150	27" TRIPLE	15H.P.
650	60	96	156	30	71	190	195	77.5	51	3,000,000	52,000	20.00	16	4	1/4" R.	3/16" R.	20GA.	1685	18,320	30" TRIPLE	20H.P.
700	60	96	156	30	71	214	219	77.5	51	3,500,000	58,000	24.00	18	4	1/4" R.	3/16" R.	20GA.	1810	20,000	30" TRIPLE	25H.P.
750	60	96	156	30	71	214	219	77.5	51	4,000,000	60,000	28.00	20	4	1/4" R.	3/16" R.	20GA.	1935	22,000	30" TRIPLE	30H.P.

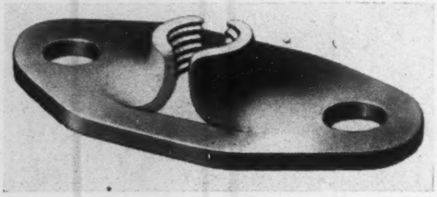
Write for full information

NATIONAL HEATER COMPANY

MINNEAPOLIS 2 402 ESSEX BLDG. MINNESOTA

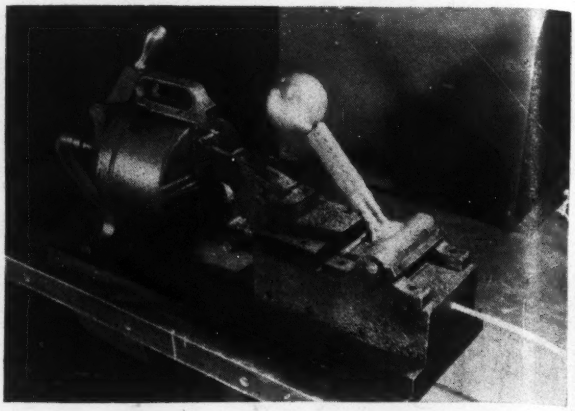
resistant plastic to insure full insulation and to eliminate arcing due to slag, moisture, or contact with grounded surfaces. Designed for mechanical or solder cable connections, the holder features quick change and permits burning of electrodes to within ½ in. of the holder tip. Left hand threading in the tip and handle connection securely grips the electrodes and prevents their slipping, says the manufacturer.—Allison Tool & Engineering Co., 4031 Whittier Blvd., Los Angeles 23, Calif.

New Speed Nut

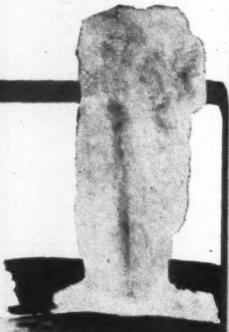


No. 2665**—A new "Hi-Stress" speed nut conforming to AAF specification No. 25531, has been developed, and according to the manufacturer, approved by the Army Air Forces. It is a light weight, one piece integral unit, "with an unusually low installation torque that allows speedy insertion of screws and bolts." It is said to retain its self-locking torque even after many removals under service conditions.—Tinnerman Products, Inc., 2018 Fulton Road, Cleveland 13, Ohio.

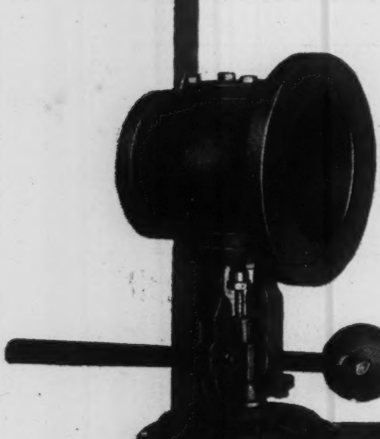
Tube Beading Device



No. 2666—Frank J. Nickel, tool repair man at the Glenn L. Martin Co., Baltimore, Md., has solved the small diameter tube beading problem at that company where ¼ in. OD tubing is used extensively for hydraulic, fuel, and instrument lines. The new device produces the bead by squeezing. The machine itself consists of a pneumatic squeezer with two sets of blocks cut out for ¼ in. tubing. One set of blocks is stationary and the other movable, and in each set the ¼ in. hole is enlarged to a cup shape at one end. The tube to be beaded is clamped securely in place in the stationary blocks, with the end upon which the bead is to be raised extending out through the cup shape opening and into the movable blocks where it is likewise clamped. Both sets of blocks are actuated by a cam clamp. After the tubing has been clamped in place, a pneumatic cylinder pushes the movable blocks forward, compressing the tube which expands into the cup shaped recess to form the bead. The height of the bead is controlled by the movement of the cylinder arm and the size of the cutout in the blocks. The new method shortens the tube about ⅛ in. but



WHEN IT COMES TO
REGULATING VALVES, THIS IS
"OLD FAITHFUL"



Probably the most famous regulating and reducing valve ever sold . . . for any service where close regulation is required. The dependable K & M "Special 98" is made in straight (½" to 12") and expanded outlet (1x2" to 8x16") patterns . . . and in two weights: *Standard,* for initial pressures to 125 lbs. and reduced pressures from 0 to 25 lbs., and *Extra Heavy,* for initial pressures to 200 lbs. and reduced pressures from 0 to 25 lbs. Valve seats and discs are of Government Bronze or stainless steel, with bodies of bronze or semi-steel. Also single-seated for tight shut-off in dead-end service. Our Engineering Department is ready to help you on any pressure control problem.

Write for General Catalog 66

KIELEY & MUELLER, INC.
MANUFACTURERS OF PRESSURE AND LEVEL CONTROLS
NORTH BERGEN, NEW JERSEY

Cooling Tower DOs and DON'Ts

-by MARLEY

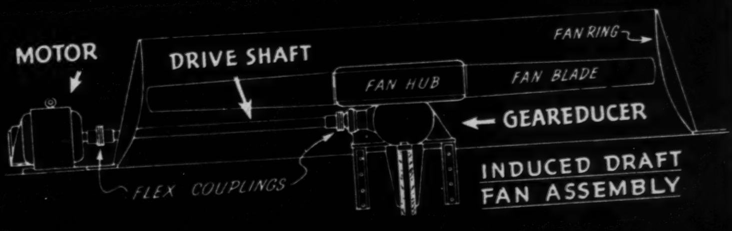
(No. 3 of a series)

MECHANICAL MAINTENANCE

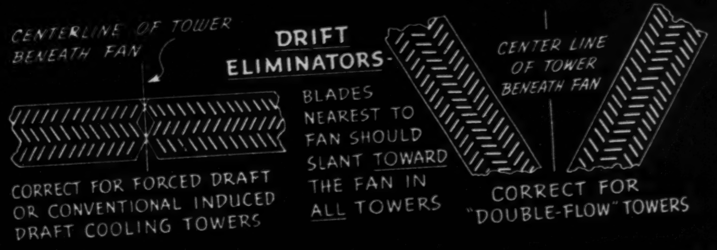
Well-kept equipment delivers the best operating results for the least overall maintenance cost.

FANS—Inspect frequently to see that blade clamps and hub bolts are tight. Fans may get out of balance, due to neglect and corrosion, and require rebalancing. Hence clean and paint all corrodible metal parts as often as necessary, depending upon the nature of the tower water and the atomosphere.

SPEED REDUCTION GEARS—Follow the manufacturer's lubrication instructions religiously. (Marley "Geareducers," although outstandingly rugged and trouble-free, nevertheless deserve and require the minimum care set forth on the name plate.) There is always slight "play" in ring and pinion gears, but if excessive, wear is indicated. Pinion shaft end play or fan shaft side play indicates excessive bearing wear. If oil leaks around either shaft, oil seals should be replaced.


MOTOR
DRIVE SHAFT
FAN RING
FAN HUB
FAN BLADE
GEAREDUCER
FLEX COUPLINGS
INDUCED DRAFT FAN ASSEMBLY

DRIVE SHAFTS—Keep drive shafts in alignment and balance, all coupling bolts tight. Replace or repair universal joints or flexible couplings when worn. Lubricate these joints as necessary. (Marley's disc-type couplings require no lubrication.) Keep shaft guards securely in place.


CENTERLINE OF TOWER BENEATH FAN
DRIFT ELIMINATORS
BLADES NEAREST TO FAN SHOULD SLANT TOWARD THE FAN IN ALL TOWERS
CENTER LINE OF TOWER BENEATH FAN
CORRECT FOR FORCED DRAFT OR CONVENTIONAL INDUCED DRAFT COOLING TOWERS
CORRECT FOR "DOUBLE-FLOW" TOWERS

MOTORS—Grease ball-bearing motors with an approved water-resistant lubricant every one to three months, according to manufacturer's instructions. Do not over grease.

Once a year check insulation value with a megger, or by similar means, and paint the motor winding with approved insulation varnish and the frame with anti-rust paint.

WOOD PARTS AND FRAMEWORK—Check drift eliminators each season to see that all blades are in place and alignment. If necessary to remove any section, make sure it is replaced with blade edges slanting toward the fan as illustrated in the accompanying sketch.

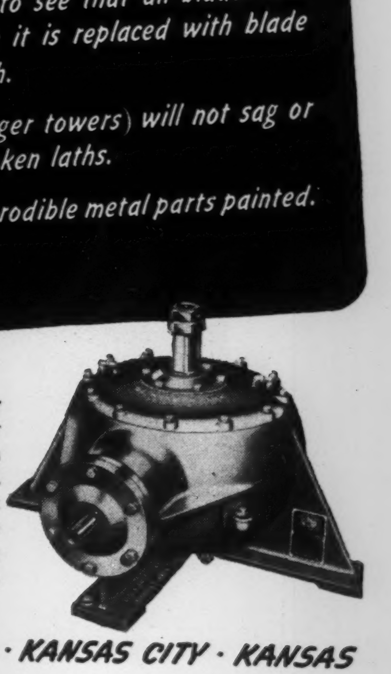
Well-designed filling (the "decking" or latticework inside most larger towers) will not sag or warp appreciably but if such condition is noted, correct it. Replace broken laths.

Bolts of tower frame and casing should be tightened yearly and corrodible metal parts painted. Redwood does not require painting for weather protection.

MARLEY COOLING TOWERS

34-A

DO YOU KNOW— that the Marley Geareducer is the only speed reducer designed specifically for cooling tower service and the only such drive furnished as standard equipment. Rugged dependability under the most severe conditions. Positive, direct drive for fans from motor outside of fan ring in an accessible location out of the hot, damp air stream.



THE MARLEY COMPANY, INC. · KANSAS CITY · KANSAS

this can be easily compensated for in the development of the true length. At the same time, the tool offers a further advantage in that it increases the wall thickness of the tube in the area around the bead, adding to the strength of the bead.

Anthracite Stokers

No. 2667—Combining—says the manufacturer—accepted optimum practices with "features never before obtainable in an anthracite model," a line of hopper and self-feed "Winkler" ash removing anthracite stokers for smaller commercial requirements is being produced. Clinkering type ash residue removal models are being manufactured in larger capacities through 400 lb of coal per hr. The "ARA" (ash removing anthracite) models, in both hopper and self-feed types, feature inter-planetary fully automatic transmission, which has no shear pin; a rotating burner head "which provides most satisfactory coal distribution and burning characteristics," a screw type elevator, "Eez Air" fly ash reduction control, and other design details. Larger models also feature the inter-planetary transmission, narrow burners, and widely distributed air passage tuyeres. These larger capacity clinkering type units are also available in both hopper and self-feed models—U. S. Machine Corp., Lebanon, Ind.

• MEETINGS & CONVENTIONS •

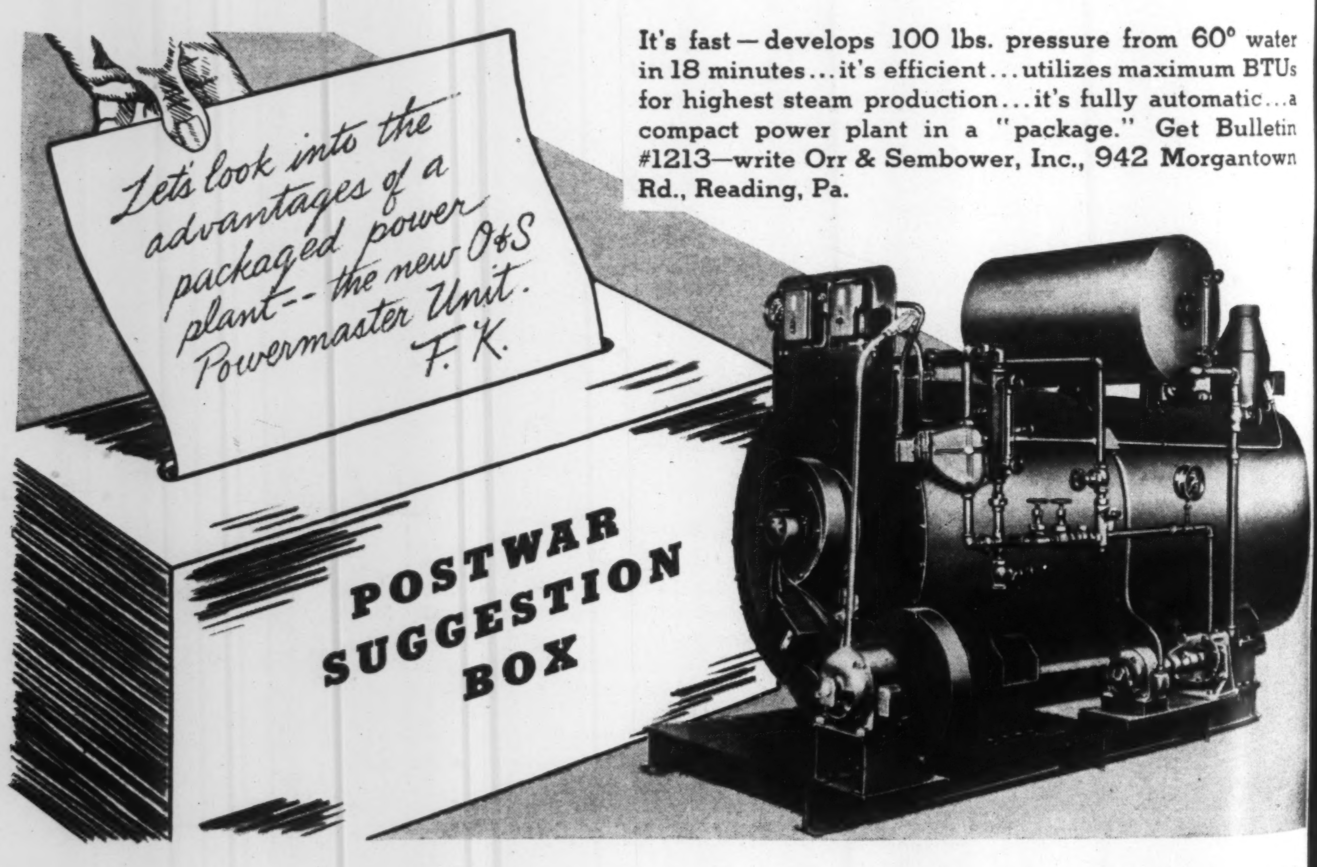
Power Engineers

National Association of Power Engineers, 62nd na tional convention, August 22-25, Hotel Jefferson, St Louis, Mo. F. C. Laufketter, Hotel Jefferson, St. Louis is general chairman of the local convention commit tee. The 44th National Power Show will be held concurrently.

Welding Society

American Welding Society, 25th annual meeting October 16-19, Hotel Cleveland, Cleveland, Ohio., in conjunction with the National Metal Conference at the Hotel Statler in Cleveland. A session on piping and pressure vessels is scheduled for Wednesday afternoon, October 18, with papers on pressure vessel welding, by Edward B. McGuire, Hamler Boiler & Tank Co.; effect of normalizing on welded carbon-molybdenum pipe, by D. H. Corey, The Detroit Edison Co.; welding of dissimilar metals, by E. C. Chapman and R. E. Lorentz, Combustion Engineering Co.; and welding of vessels, by H. H. Needham, A. O. Smith Corp.

For your convenience in obtaining more information about any new equipment, see coupon on page 151. Add the new products and companies listed to your Directory Section which you received in your January 1944 Heating, Piping & Air Conditioning and thus keep your records of sources of supply up to date throughout the year. Single asterisk indicates equipment not listed in Directory Section; double asterisk equipment and manufacturer not listed.


Let's look into the advantages of a packaged power plant-- the new O&S Powermaster Unit. F. K.
POSTWAR SUGGESTION BOX

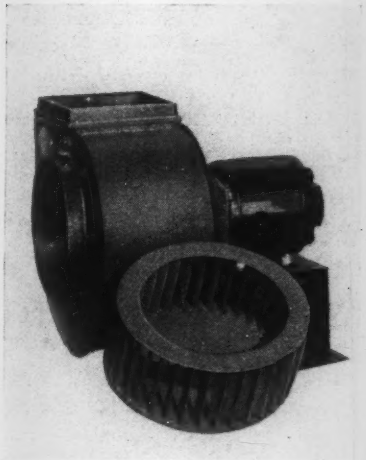
It's fast—develops 100 lbs. pressure from 60° water in 18 minutes...it's efficient...utilizes maximum BTUs for highest steam production...it's fully automatic...a compact power plant in a "package." Get Bulletin #1213—write Orr & Sembower, Inc., 942 Morgantown Rd., Reading, Pa.

JOHNSON *Health-aire* PRODUCTS

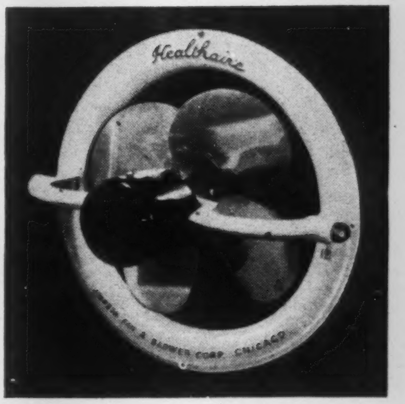
Climate as you like it

DIRECT CONNECTED
and
BELT DRIVEN
FANS
and
BLOWERS

NOW AVAILABLE!



YES, you can get Johnson Direct Connected Fans and Belt Driven Blowers *now* for all industrial and commercial jobs. Nationally known for engineering and manufacturing excellence, Johnson Fans and Blowers have always been and continue to be tops in performance and long term economy. Install Johnson equipment for complete satisfaction!



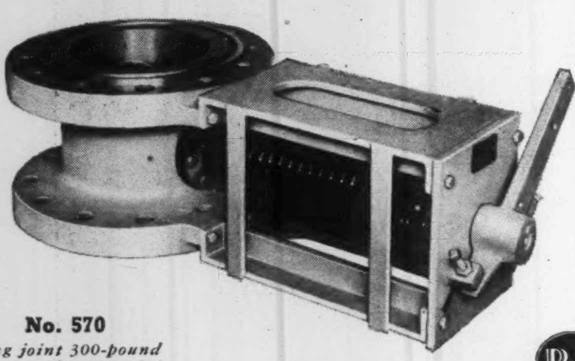
Write today for complete details. Learn how Johnson Health-aire engineers and equipment can work with you to simplify your requirements.

JOHNSON FAN AND BLOWER CORP.

1319 W. LAKE STREET, CHICAGO 7, ILLINOIS

Quick Shut-off

Under High Pressure and Temperature



No. 570

Ring joint 300-pound flange with air cooled stuffing box. Hand lever operated for temperatures up to 1900°F.

R-S QUALITY PRODUCTS SINCE 1904

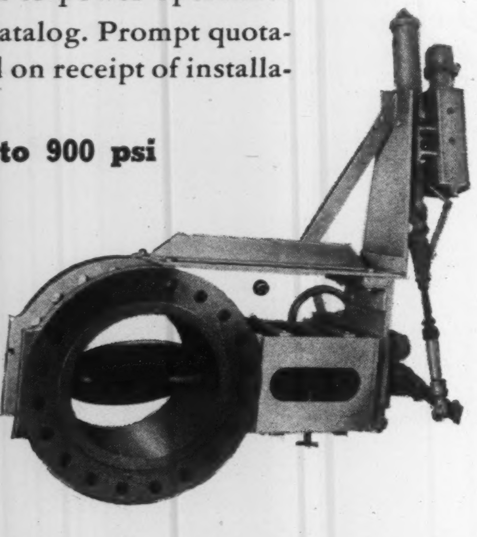
A widely diversified line of special R-S Butterfly Valves to meet individual specifications in the high pressure and temperature ranges are in constant production.

Either or both the body and vane can be fabricated from non-corrosive, non-abrasive and acid-resisting metals. Pressure iron castings can be alternated for vital war metals, at considerably lower cost.

For fast, easy control and shut-off of volume and pressure, even under high pressure and temperature conditions, the R-S Butterfly Valve has no equal. Easily adapted to power operation.

Write for Catalog. Prompt quotation furnished on receipt of installation data.

15 to 900 psi



No. 607

Operated for control at elevated temperature. Raised face flanges, finned lubricated stuffing box and hydraulic cylinder positioner with handwheel and declutching unit (patent applied for).

VALVE DIVISION

R-S PRODUCTS CORPORATION

132 Berkley Street • Philadelphia 44, Pa.

R-S Streamlined BUTTERFLY VALVES

• WPB . . . OPA . . . PAW . . . Etc.

COAL

SUMMER COAL DELIVERY URGED: In ur users to obtain initial supply of coal during sum months to minimize delay in deliveries when weather sets in, ODT explained last month that purchases must be limited to amounts permitted der regulations of Solid Fuels Administration War.

ODT ADVISES FILLING OF COAL BINS: warned users last month to fill their coal bins du summer months if they wish to be certain of ha a supply when winter comes.

CONSTRUCTION

CONSTRUCTION REGULATION CHANGED: list of construction materials which may not be in industrial construction, carried on under pr sions of direction No. 1 to controlled materials regulation No. 6, has been issued in schedule A struction limitations) to that regulation, WPB May 29.

FHA ISSUES REVISED LOAN REGULATIO Commissioner Abner H. Ferguson of Federal Hous Administration, NHA, announced issuance of rev regulations, effective July 1, on property improvem loans insured with FHA. The regulations were signed in anticipation of enormous volume of rep remodeling, and modernization work on residen properties in postwar market.

NEW INSTRUCTIONS ISSUED FOR FILING WPB FORM 617: Applicants who normally use W form 617 to obtain WPB permission under conser tion order L-41 to acquire or construct facilities advised to follow revised instructions for filing this form, WPB said June 24. Copies of the revi instruction sheets for the filing of form 617 are available at WPB field offices.

NHA TO ISSUE APPROVALS: Directive No. which delegates authority to NHA for housing struction, has been amended to permit NHA to is approvals in the name of WPB on the form requi by any L, M, or P order for purchase of building pr ucts and materials for housing projects that c under jurisdiction of NHA, WPB said May 25.

EQUIPMENT AND SUPPLIES

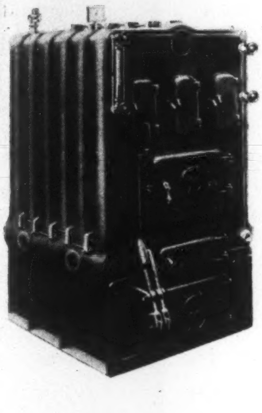
ALLOY STEEL TUBING DELIVERIES MOD FIED: WPB announced June 12 issuance of dir tion No. 16 to controlled materials plan regulati No. 2, which modifies schedule A of that regulati with respect to acceptance of deliveries of alloy st tubing, other than airframe and engine tubing.

BRONZE TO BE USED IN WATER METE Bronze again may be used in manufacture of wa meters of 1 in. size or less, WPB's office of war u ities announced June 15 (amendment sch. 1 to L-1

COPPER TUBING FOR REPAIRS: Procedure tablished for use by repairmen under controlled ma rials plan regulation No. 9A in obtaining materi may be used to procure only three types of copper

Good News—

About Burnham Boilers

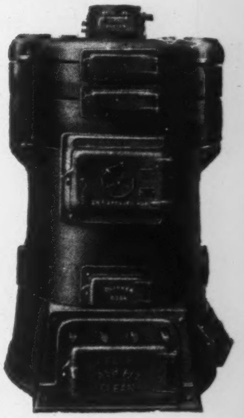


High Quality Standards

In spite of trying conditions, Burnham Boilers still maintain their high standards of quality. QUALITY, the hidden ingredient, is something which we believe cannot be compromised.

Improved Deliveries

Delivery of Burnham Boilers has now improved to a point where practically all sizes now in production can be shipped promptly.



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Dole Air Valves
McDonnell Feeders and Cutoffs
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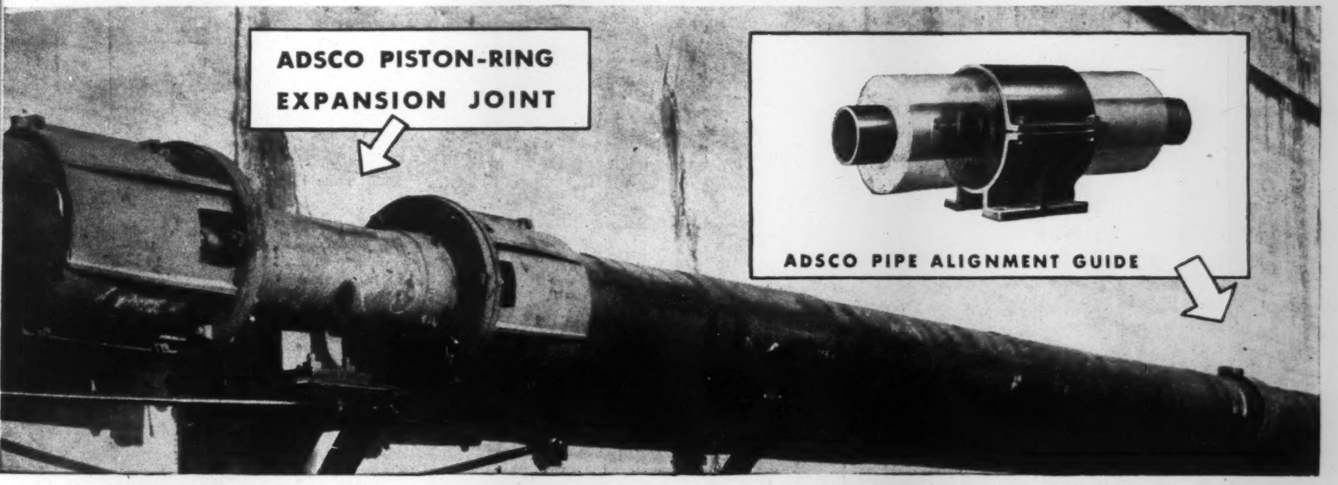
Burnham Boiler Corporation

IRVINGTON, NEW YORK—Dept. P **ZANESVILLE, OHIO—Dept. P**

Export Department: 50 Church Street, New York 7, N. Y.



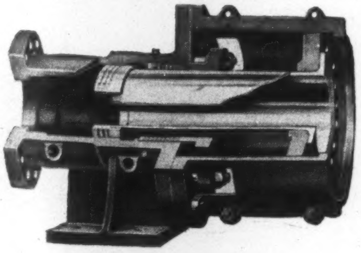
THE PERFECT COMBINATION FOR CONTINUOUS SERVICE

Because the ADSCO Piston-Ring Expansion Joint is the only slip type joint that can be unpacked and repacked under full operating pressure, it is the choice of engineers for every job where interruption to service must be eliminated.

The ideal method of installation for any slip type expansion joint is illustrated above. Here in a big busy railroad terminal the pipe leading into the slip of the ADSCO Piston-Ring Expansion Joint is guided by an ADSCO Pipe Alignment Guide. By keeping the pipe in true alignment, the guide prevents the slip from binding or scoring the packing — thereby making intervals between repacking few and far apart.

For complete information on Expansion Joints and Pipe Alignment Guides write for Bulletins 35-15HP and 35-70HP.

AMERICAN DISTRICT STEAM COMPANY
NORTH TONAWANDA, N.Y.



ADSCO PISTON-RING EXPANSION JOINT can be repacked under full operating pressure.

ADSCO PISTON-RING EXPANSION JOINT

Can be repacked under full operating pressure

YOU don't usually marry the first girl you meet! Considering an oil burner franchise is not a one-two-three matter, either.

When the time comes for you to look over the field, take the time to talk to Quiet May.

QUIET
MAY
OIL BURNERS

The proven and dependable Dual Utility Oil Heating Unit will be included in the line when we resume production.

May Oil Burner Corporation
Baltimore-3, Md.

copper base alloy tubing or pipe from brass mills or brass mill warehouses, WPB said June 29.

HEATING EQUIPMENT INSTALLATIONS: The recent amendment to WPB's construction order L-41 that provided for installation of heating and combustion control equipment within certain cost limits without WPB approval was not intended to change restrictions on purchase and installation of new heating equipment such as boilers and furnaces, WPB's plumbing and heating division explained July 1.

INSTRUMENT REGULATIONS CLARIFIED: Scope of two regulations on simplification of industrial type instrument production was clarified May 24 by WPB, by amending schedule IV (indicating dial pressure instruments) and schedule VIII (railroad gages) to limitation order L-272.

INSULATION: The exception made from conservation order L-41 for insulating buildings with certain materials applies only to the insulation of existing buildings without change in the use of these buildings, the War Production Board said May 24. The ruling states that the exception does not apply to the use of insulating materials in the original construction of a building, to an alteration to a building, or to a conversion from one purpose or use to another.

For example, if an existing building is being converted from a store to a frozen food locker plant, the cost of the insulating materials installed must be included as part of the cost of conversion subject to the cost limitations of order L-41 as these materials are being used to convert a store to a locker plant, not to insulate a store. This ruling is made in interpretation 7 to conservation order L-41.

MORE WATER HEATERS TO BE MADE: Provisions have been made to allow production of more durable and satisfactory direct fired side arm and indirect water heaters, hot water storage tanks and range boilers, WPB said June 5, in amending orders L-185 and L-199.

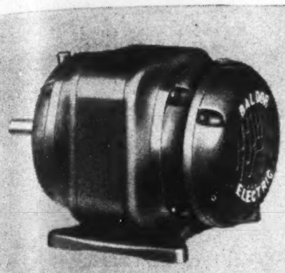
PRICE INCREASE AUTHORIZED FOR WARM AIR FURNACES: An increase of 9 per cent in manufacturers' lowest published list prices in effect on August 3, 1943, for cast iron warm air furnaces burning wood, gas, or oil, with a Btu output of 900,000 or less at the register or outlet, was announced June 24 by OPA. A 9 per cent increase was also granted manufacturers of repair parts for both cast iron and steel warm air furnaces. (Amendment 42 to order A-1 under MPR 188, effective June 24.)

QUOTAS FOR BOILERS, STORAGE TANKS SET: Production quotas for range boilers, expansion tanks, and hot water storage tanks have been set for the period June 2 through December 31, 1944, WPB said last month (revised limitation order L-199).

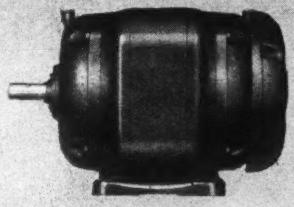
TIN FOR SOLDER RULES MODIFIED: Rules governing use of tin in solder and bronzes have been modified, effective June 6, 1944, WPB announced.

FUEL OIL

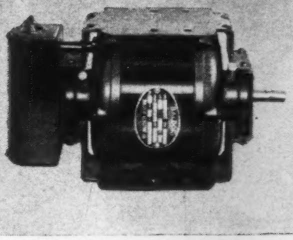
OIL RATIONING ORDER: Specific rules under which fuel oil suppliers must handle coupon sheets deposited with them by consumers were given by OPA in amendment 8, dated May 23, to revised ration order 11. Amendment 9 to RO 11 issued by OPA May 30 covers issuance of oil rations for space heaters



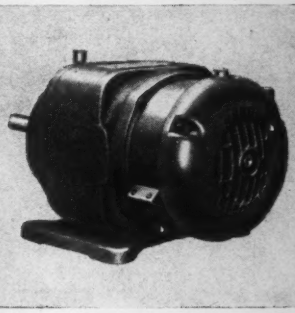
BALDOR glass-insulated motors are used for all applications; especially recommended where limited space and weight is a factor.



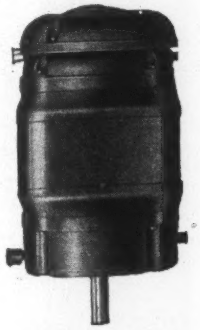
BALDOR totally enclosed motors, STREAMCOOLED DESIGN, available in 1 ph., 3 ph. and D. C.



BALDOR fan and blower motors, gimbal-mounted, assure Quiet Operation.



Fully compensated D.C. motors; available in standard and low voltage for truck, railway and traction service.



BALDOR face-mounted vertical motors; totally enclosed STREAMCOOLED DESIGN; 1 ph., 3 ph. and D. C.

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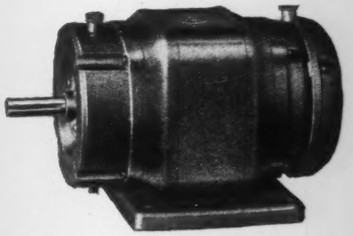
BETTER MOTORS

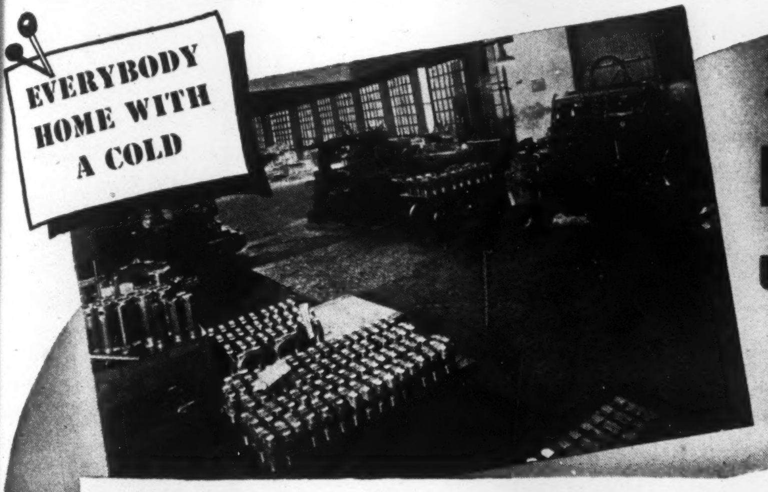
25th YEAR of engineering service to motor buyers

Regardless of mechanical specifications and current characteristics required, Baldor is qualified by experience to handle your motor problems. The complete Baldor line includes all types of motors 1/20 to 20 H. P.

BALDOR ELECTRIC COMPANY, ST. LOUIS 10, MO.
District Offices in Principal Cities



BALDOR face-mounted horizontal motors; totally enclosed, STREAMCOOLED DESIGN; 1 ph., 3 ph. and D. C.



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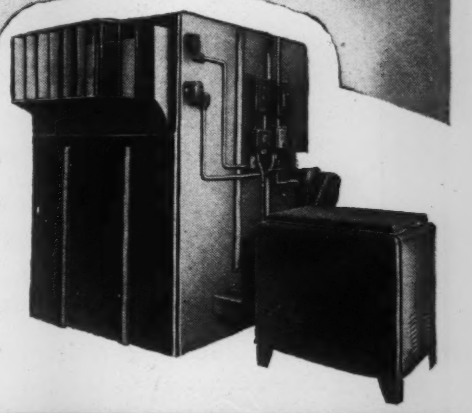
UNIT HEATER STOKER-FIRED



A Directherm will keep your plant warm and every man on his job.

It spreads the heat evenly as far away as 200 feet and squeezes 80% fuel energy out of coal, gas or oil. Easily installed and operated; eliminates costly duct work, radiators, and pipes.

Little maintenance required — automatic controls do the work.

Made in six sizes (300,000 — 1,700,000 BTU). Write for our descriptive bulletin.

AIRTHERM MANUFACTURING COMPANY

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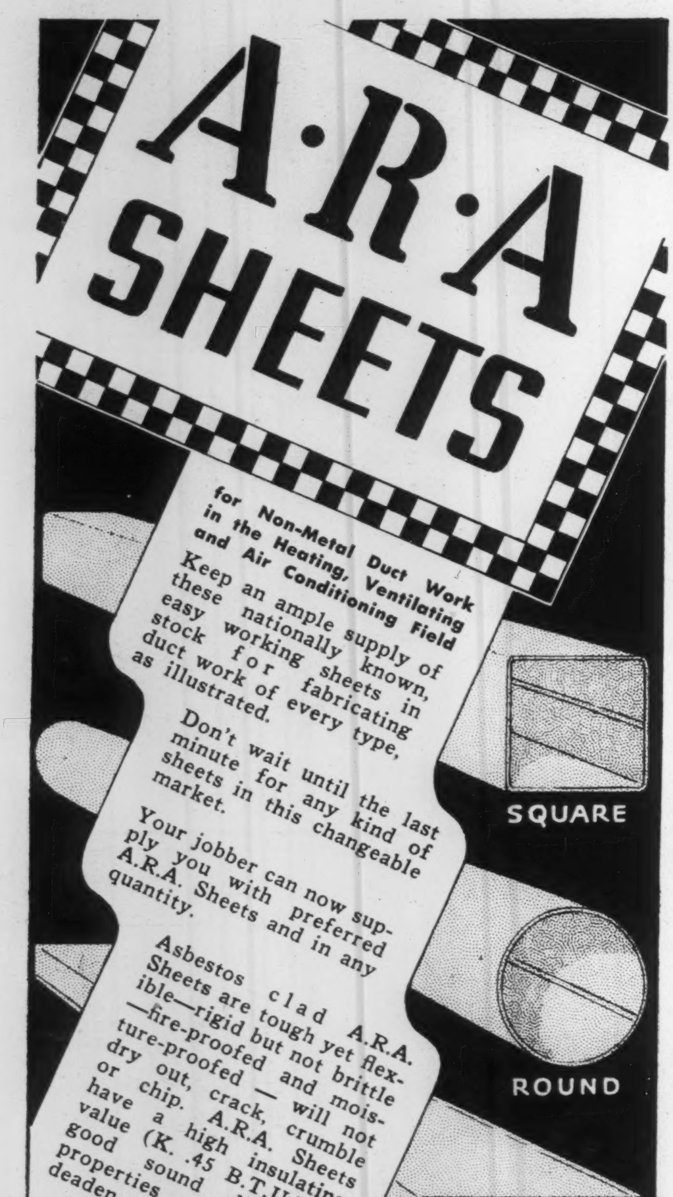

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Get genuine A.R.A. Sheets from your Jobber.

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and cooking equipment, and separate water heating equipment. (Also see erratum sheet of May 30 for this amendment). Amendment 10 to RO 11, dated June 2, provides that consumers may use period 1 coupons for 1944-45 heating year immediately upon receiving them, to encourage movement of fuel oil from dealers to consumers well in advance of heating season. Amendment 11 to RO 11, dated May 27, covers acceptance by primary suppliers of transfers, and reports by persons shipping fuel oil into the limitation area. Amendment 12 to RO 11, dated June 8, gives a table of maximum heating allowances for residential space heaters by floor area. Amendment 13 to RO 11, dated June 27, provides for larger rations for those who use oil only for heating water during the summer. Amendment 14 to RO 11, dated June 28, allows extra oil allowances for householders heating their homes only with stoves when there are children under 6 years old living in the household.

SOME FUEL OIL CEILINGS MADE SPECIFIC: For simplification purposes, aiding both buyer and seller, tank wagon ceiling prices to consumers for Nos. 2, 3, and 4 distillate fuel oil in New York, Pennsylvania, Delaware, and Maryland, and in the counties of Arlington and Fairfax, Virginia, have been listed by cents per gallon in amendment 10 to MPR 88, effective May 31.

CIVILIAN OIL BURNER PRODUCTION SUGGESTED: Relaxation of limitation order L-74 (oil burners) to permit production of limited number of class B (residential) oil burners to replace old equipment, badly worn or damaged beyond repair, was recommended by oil burner industry advisory committee, WPB said last month.

CERTAIN FUEL SHORTAGES DUE TO INVASION: How New York, Boston, and Philadelphia almost became the first, indirect casualties of the invasion was revealed last month by Deputy Petroleum Administrator Ralph K. Davies. Heavy and imperative demands for many forms of oil came from Gen. Dwight D. Eisenhower last winter at a time when PAW's district 1, comprising the 17 Atlantic coast states, was still having serious transportation trouble, Mr. Davies said.

PACIFIC NORTHWEST: Warfare in the Pacific, increasing daily in scope, will necessitate continuation of fuel oil rationing in the Pacific Northwest indefinitely, Deputy Petroleum Administrator Ralph K. Davies said last month. "As our Army and Navy strike closer to the heart of Japan," he said, "it is of the utmost importance that we supply our armed forces with the great quantities of petroleum products they require." The demand for fuel oil in the northwestern states has increased tremendously since the war began, Mr. Davies said. War industries use great quantities of fuel oil and at the same time war workers have swelled the population and increased the demand for home heating oil in the area, he said.

HEATING CONTROLS

As part of the fuel conservation program for the 1944-45 heating season, the War Production Board announced May 29 that controlled materials have been made available for production of heating system controls for use in some 950,000 residential, commercial,

FREE – Manual tells how you can SAVE HEAT AND POWER

Industrial Heat and Power Conservation Manual

PRACTICAL ENGINEERING METHODS OF CALCULATING AND REDUCING PREVENTABLE HEAT AND FUEL LOSSES AND 9 TYPICAL EXAMPLES OF SAVINGS

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Here's a book that you need. It is filled with money and fuel saving suggestions. Nine case studies are covered. Some of them probably apply to your plant equipment. Look it over carefully. Use the practical survey form which accompanies the manual. Check your own savings.

You can realize these savings in your own plant with Mineral Wool Insulation because it has extraordinarily low thermal conductivity. It is easy to apply because it is light and comes in six convenient forms. Can be fitted to irregular areas. It is non-critical—always available.

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YOU CAN DEPEND ON McCORD Air Conditioning Products

BLAST HEATING COILS
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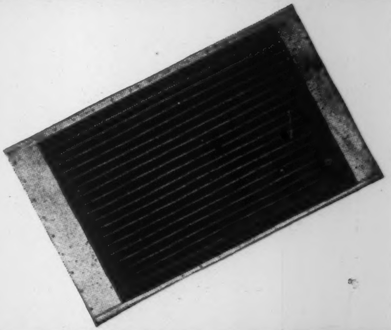
ALL TYPES

Tube fin construction, high heat conductivity. Fins metallically bonded. Ask for catalog.



HORIZONTAL TYPE UNIT HEATERS

Distinctive modern design, rugged, dependable heating core, high heat transfer capacity. Core springs mounted. Specify McCord.

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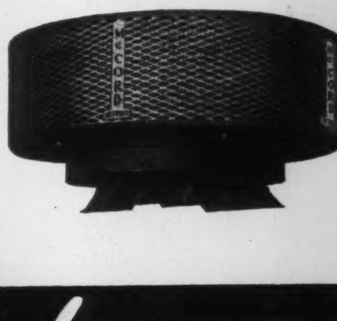
Proven modern design, spiral fin tube core. Supplied with air diffusers, louver, multi-cone or anemostat type outlet. Quotation on request.



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It gives valuable information about repairing broken BROACHES, MILLING CUTTERS, FORMING TOOLS, PUNCHES, DIES, DRILLS, TAPS, CIRCULAR SAWS, BAND SAWS and other cutting tools, with the Low-Temperature Brazing Alloy EASY-FLO.

It's a method of repairing tools that can be used in any shop—one that is sweeping through industry because it is so simple and economical.

All the information you need to put this reliable method to work in your own shop—also numerous illustrations of actual tool repairs and details of how each job is done.

WRITE FOR YOUR COPY TODAY . . . Ask for the "EASY-FLO TOOL REPAIR BULLETIN No. 14."

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institutional, and industrial heating plants. Installers of the equipment will be able to purchase the controls freely.

In allocating the necessary material for production of these controls, it was WPB's aim to make fuel saving devices available in view of the expected fuel shortage during the coming heating season, officials said.

The control equipment for private dwellings proposed under this program consists of thermostatic regulator sets for coal hand fired heating equipment, limit controls for installation on coal, oil, or gas fired equipment already provided with some thermostatic control, and barometric dampers for use with oil and stoker fired units. Each thermostatic regulator set consists of three instruments—thermostat, high limit control, and an electric damper operator.

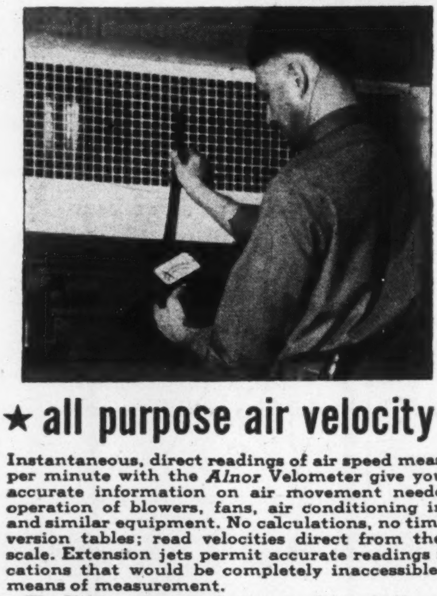
For commercial, institutional, and industrial buildings such as schools, hotels, apartments, and small factories, three types of control systems are included in the program:

1. An indoor-outdoor thermostat (a controlling device that governs the flow of heat to a structure and is affected primarily by outside weather conditions) with the necessary accessories for direct control of heat generation.

2. A system consisting of an indoor or an indoor-outdoor thermostat and an electrically actuated operator.

3. Zone control sets for use on large buildings where sectionalized or zone control is necessary be-

Alnor VELOMETER



★ all purpose air velocity meter

Instantaneous, direct readings of air speed measured in feet per minute with the *Alnor* Velometer give you the quick, accurate information on air movement needed to check operation of blowers, fans, air conditioning installations, and similar equipment. No calculations, no timing, no conversion tables; read velocities direct from the Velometer scale. Extension jets permit accurate readings in many locations that would be completely inaccessible with other means of measurement.

The Velometer is made in several standard ranges from 20 fpm to 6,000 fpm, and up to 3 inches static or total pressure. Special ranges available as low as 10 fpm and up to 25,000 fpm velocity and 20 inches pressure.

Write for Bulletin No. 2448-E.

Illinois Testing Laboratories, Inc.
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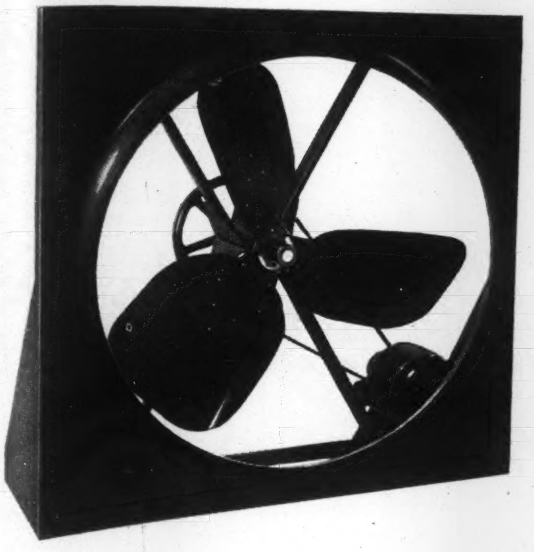

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LAU propeller type air circulating fans have many applications for maintaining constant temperatures—providing fresh air in confined enclosures — removing stale, excessively hot, or dust-laden air; fumes; smoke; etc. Available on priority ratings for reasonably prompt delivery. Plan your requirements ahead. Now is the time to schedule summer installations.

FURNISHED IN 5 DIAMETERS

Fan Size	C.F.M.	H.P.
22″	3,800	1/6
30″	7,100	1/4
36″	9,000	1/4
36″	10,150	1/3
42″	11,300	1/4
42″	12,600	1/3
48″	15,050	1/2
48″	18,000	3/4

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WORLD'S LARGEST MANUFACTURERS OF FURNACE BLOWERS

Engineers and fabricators of general Air Handling Equipment
Single Inlet and Double Inlet Blowers • Propeller Fans • Accessories

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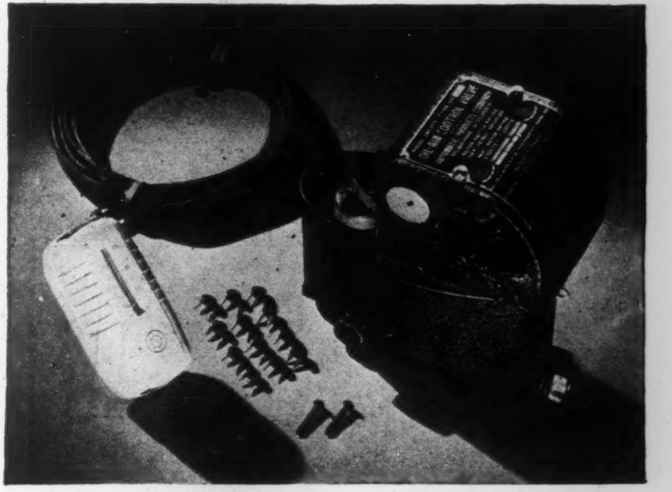
NEW DEVELOPMENTS IN A-P DEPENDABLE OIL CONTROLS WILL BENEFIT YOUR NEW PRODUCT PLANNING
AP

Right now, in A-P research laboratories, designers and engineers are readying new DEPENDABLE Oil Controls for your new post-war gravity oil burning heaters and furnaces.

Some of these new controls are for specific new products; others are the continuing developments always under progress at A-P—*anticipating* your future needs for accurate, dependable oil control on all types of oil burning appliances. You can depend on it—they'll offer the last word in modern fuel control efficiency, the product of one of the most skilled and experienced staffs of control engineers in the industry.

For an effective and profitable solution of YOUR new oil control problems, use the service of A-P research. Send blueprints, or write for engineering assistance.



A-P Complete Furnace Control Set for gravity-fed Oil Burning Furnaces Includes modern wall thermostat, constant level oil control, circulating fan switch with inbuilt transformer.

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OIL CONTROLS

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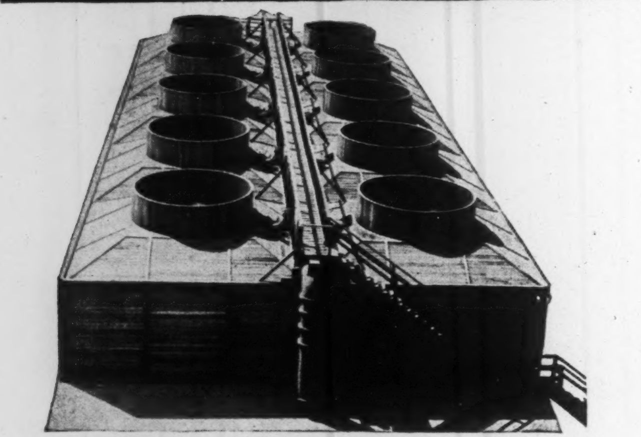
the **REASON**

"The proper coefficients for reducing (cooling tower) theory to practice are known by few . . . knowledge can be obtained only through long years of practice . . . observation of results produced by various installations . . . with varying atmospheric conditions . . . under different bases of efficiency."

Typical **APPLICATION**



Installed for War Department at large government arsenal for condenser water cooling.

Type: 10-cell Induced Draft Tower, back-to-back construction.

Construction Features: Independent operation of individual, or cell groups. Motors located out of air stream. Redwood discharge stacks prevent recirculation.

Capacity: 13000 GPM . . . 20 degree range.

NOTE: No leaks in tower casing . . . watertight wall construction. Photographed after 14 months operation.

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COOLING TOWERS, INC.
Manufacturers of All Types of Water Cooling Towers
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PLANTS AT ST LOUIS, MISSOURI AND PLAINVIEW, TEXAS

cause of the varying heat losses of the several areas of the structures.

Authorizations to individual manufacturers to produce the equipment will be made only if production in the plant in question, or labor requirements therefore, will not interfere with war production.

Manufacturers desiring to produce any specified number of the above types of equipment should file a separate CMP-48 application for the necessary material.

The controls which will be made available under this program are intended for installation primarily on furnaces and boilers for fuel conservation purposes. However, adequate maintenance and repair items will also be available for fall distribution for use in conjunction with the items made available for the conservation program, since sufficient material has already been programmed for this purpose, WPB said. Such items as radiator air valves, hot water valves, and radiator traps are included among the repair and maintenance items permitted.

SURPLUS WAR PROPERTY

Companies desiring to be informed regarding surplus merchandise offered for sale by the Treasury procurement surplus war property division should write to the nearest regional office asking to have their names placed on the mailing list. It is important that the request be accompanied by a statement of the specific merchandise lines which the company normally manufactures or buys for resale.

The categories of surplus merchandise whose disposal is the responsibility of the Treasury procurement surplus war property division include heating, air conditioning, and refrigeration equipment, accessories, and controls.

Sterling Smith Resigns From War Production Board

Sterling F. Smith, chief of the refrigeration and air conditioning section of the general industrial equipment division of the War Production Board has resigned effective August 1, 1944, WPB announced July 5.

Mr. Smith has been with WPB since September 1941, and since then has administered regulations governing production and distribution of refrigeration and air conditioning equipment; rules governing distribution of "Freon," generally used in refrigerating equipment of all types; and regulations governing emergency service of refrigerating equipment.

Charles M. Stuart, who has been deputy chief of the special equipment branch of the general industrial equipment division, is succeeding Mr. Smith.

Mr. Smith is going to Chicago, after a vacation, to assume the managership of the commercial refrigeration division of Mills Industries of that city.

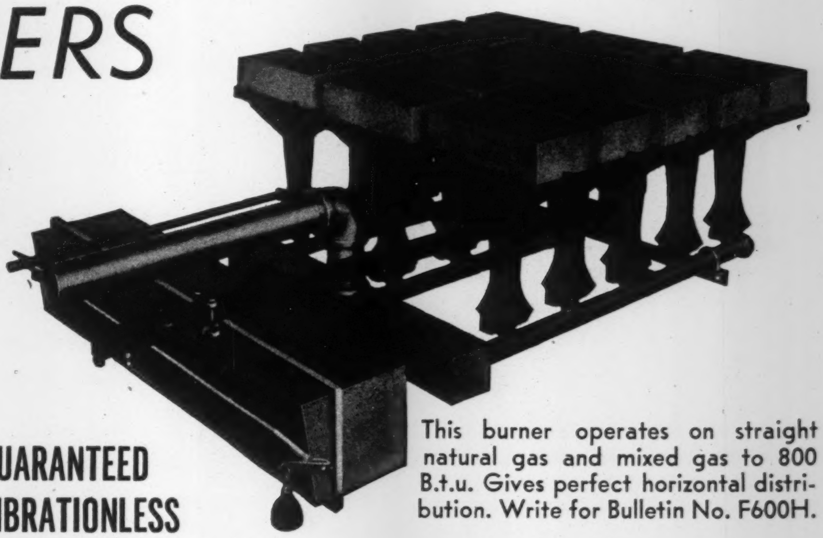
Prior to his association with WPB, Mr. Smith was with the Nash-Kelvinator Corp., in New York.

FIGHT FUEL WASTE

WECO-N. G. E. Series F600 GAS BURNERS

These burners are available for ratings from 50,000 to 10,000,000 B.t.u. output, for use in heating boilers, power boilers—in any metal firebox or sectional boiler.

Featuring flexibility to meet various firebox shapes and sizes at various gas pressures, and low draft loss. Full automatic controls that operate properly can be easily applied.



GUARANTEED VIBRATIONLESS

This burner operates on straight natural gas and mixed gas to 800 B.t.u. Gives perfect horizontal distribution. Write for Bulletin No. F600H.

THE WEBSTER ENGINEERING CO.

TULSA —DIVISION OF— **OKLAHOMA**

Surface Combustion . . . . Toledo, Ohio

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Bulletin SC-101
and the Supplemental
Capacity and Dimension Tables
Bulletin SC-102

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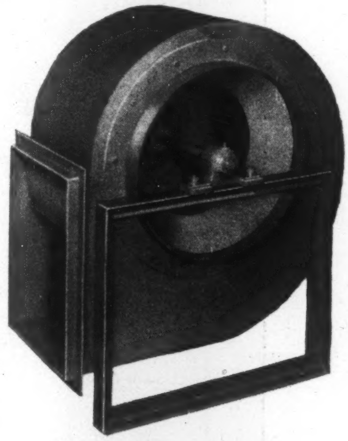
Surprisingly Quick Deliveries



Forward Curved Blades

GENERAL BLOWER CO.

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BULLETIN SC-101

"GENERAL"
MULTIBLADE
EXHAUSTERS

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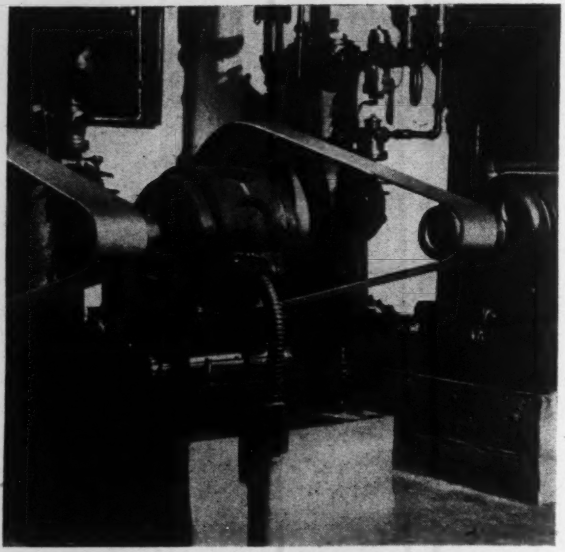
Illustrated: Backward Curved Blades

Tannate-Rockwood

the drive that gives you both ECONOMY and DEPENDABILITY



For a truly economical drive on air conditioning equipment the Tannate-Rockwood pivoted motor base drive is a wise choice. It requires practically no attention, thereby saves time and trouble. The weight of the motor on the pivoted Rockwood base automatically adjusts belt tensions, so that even when the load fluctuates, high efficiencies are maintained. The unusual strength and firm pulley grip of the Tannate Belt assures smooth running and a steady pull. For more details write us.

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No. 4727—8 p. booklet on adhesives or coating materials, impregnators, spray-on insulators, and sound deadening compounds, listing the various formulas and showing viscosity, bonding range, method of application, etc.—Minnesota Mining & Mfg. Co., 900 Fauquier Ave., St. Paul 6, Minn.

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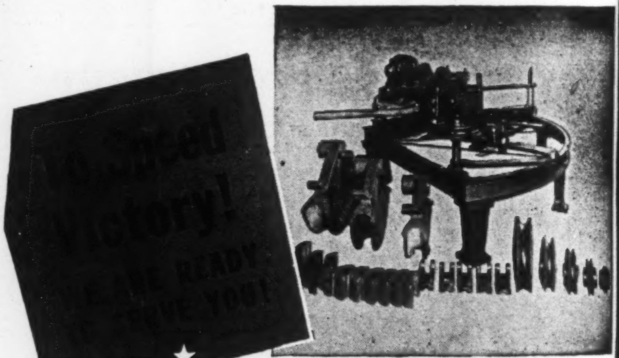
No. 4728—32 p. bulletin on air filtration and dust control—the sixth printing of a booklet originally issued in 1932—with chapters on industrial dust problems; atmospheric dust; process dust; filtered air for numerous applications, including air conditioning, ventilation, drying, product finishing, bacteria and mold spore control, cooling electrical equipment, engines and compressors, etc.; control of process dust; "Roto-Clone" dust control, the hydrostatic precipitator; "Airmat" dust arresters; and ventilated benches, booths, and enclosures.—American Air Filter Co., Inc., 107 Central Ave., Louisville 8, Kentucky.



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No. 4730—4 p. folder illustrating and describing new barometric draft control for fuel conservation, listing its features.—Perfex Corp., 500 W. Oklahoma Ave., Milwaukee 7, Wis.

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No. 4731—2 p. bulletin (2) on damper control with outside thermostat for use with hand fired hot water heating boilers "in order to achieve the advantages of temperature control directly by the weather." Information on construction, prices, and dimensions is included. —Sarcotherm Controls, Inc., 222 W. North Bank Drive, Chicago 54, Ill.

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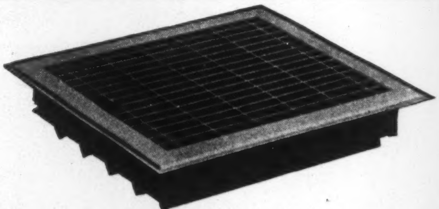

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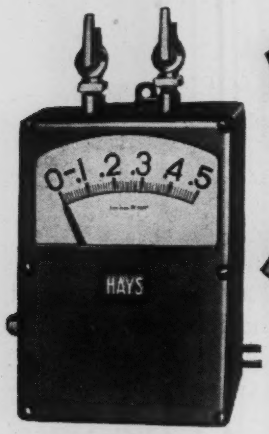

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No. 4735—114 p. catalog on "Infra-Red" gas burners, combustion equipment, and accessories, and including a wealth of engineering and reference material. Information on burners, mixing equipment, valves, gas pressure regulators, motors and blowers, pilot safety devices, temperature, controls and electrical accessories, is included, and there are data on velocity pressures, motor ratings, measurement of electrical power, calculating power requirements, heat losses, thermal ca-

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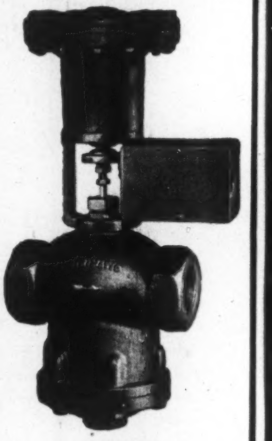
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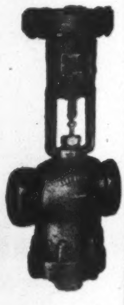
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pacity of gases, etc. The information is carefully classified for easy reference.—Burdett Mfg. Co., 19 N. Loomis St., Chicago 7, Ill.

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Heavy Duty Heaters

No. 4737—36 p. bulletin on heavy duty heaters, discussing in detail features of the design, showing cross sections and construction details, and with tables of temperature rise constants, dimensions, data for selection of heaters, and tabulations of final temperature and rate of condensate. Piping and installation notes are included.—B. F. Sturtevant Co., Damon St., Hyde Park, Boston, Mass.

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No. 4738—Issue of publication, Performance (Vol. 6, No. 3), summarizing tests of insulation value of mineral wool in walls made at University of Illinois.—

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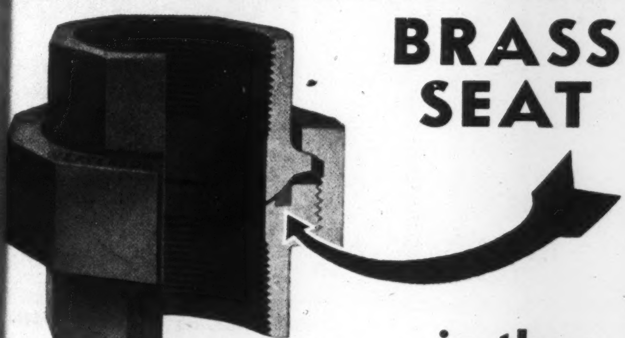

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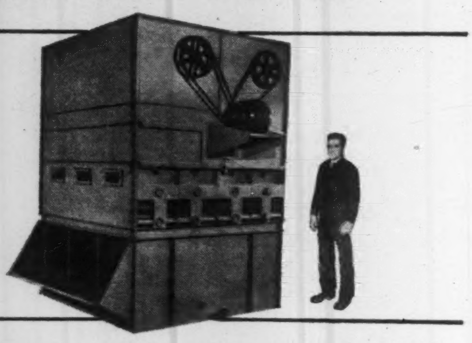

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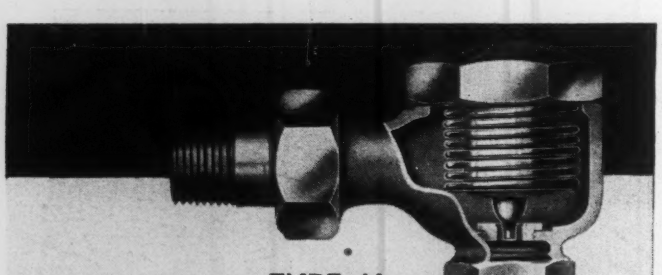

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184

National Mineral Wool Association, 1270 Sixth Ave., New York 20, N. Y.

Low Temperature Brazing

No. 4739—4 p. bulletin (27) on low temperature brazing covering the use of "Sil-fos" and "Easy-Flo" in the marine field, including silver brazing joints in a main injection pipe assembly, and brazing a straight extension to a 14 in. copper bend.—Handy & Harman, 82 Fulton St., New York 7, N. Y.

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No. 4740—40 p. technical data book on low temperature welding, with information on the process, where it should be used, what metals can be welded, and "why the method costs less." Also, a bulletin on salvaging tools, with low temperature welding, and a 4 p. folder on use of low temperature welding for salvaging defective castings and for essential maintenance.—Eutectic Welding Alloys Co., 40 Worth St., New York 13, N. Y.

Microfilming

No. 4741—Bulletin describing a new and improved application of microfilming to pencil engineering drawings made on transparent paper, as well as other valuable records, documents, drawings, maps, and materials. The bulletin points out advantages in time and money savings, and document insurance features by use of the method.—Microcopy Corp., 2800 W. Olive Ave., Burbank, Calif.

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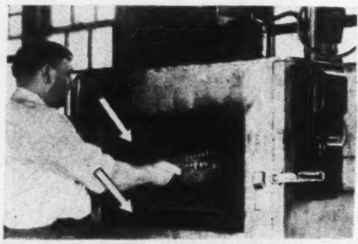

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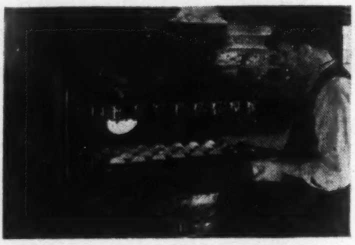

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It develops 400° F. where needed—nowhere else—

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the war effort, both on land and sea.—Worthington Pump & Machinery Corp., Harrison, N. J.

Protective Paints

No. 4743—6 p. bulletin on penetrating protective paints, briefly describing the various types available and their uses.—Wilbur & Williams Co., Boston 16, Mass.

Refrigeration and Air Conditioning Accessories and Supplies

No. 4744—Looseleaf catalog of accessories and supplies for refrigeration and air conditioning plants designed to give quick complete information on valves and fittings, oil, cold storage doors, renewal parts, and with tables of pertinent data.—York Corp., Roosevelt Ave., York, Pa.

Sediment Strainers

No. 4745—1 p. bulletin (89-4) on "Adsco" sediment strainers for 125 psi, with semi-steel body and removable, perforated, noncorrosive metal screen, in pipe sizes from ½ to 2 in.—American District Steam Co., North Tonawanda, N. Y.

Spray Painting Equipment

No. 4746—Chart designed to aid users of spray painting equipment to make their present units last as long as possible. Important steps to follow in caring for spray guns, paint cups, hose, transformers, air compressors, spray booths, and exhaust fans are given. —DeVilbiss Co., 300 Phillips Ave., Toledo 1, Ohio.

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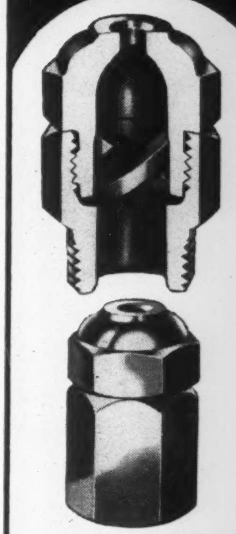

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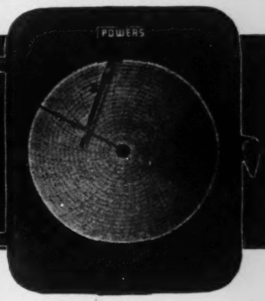

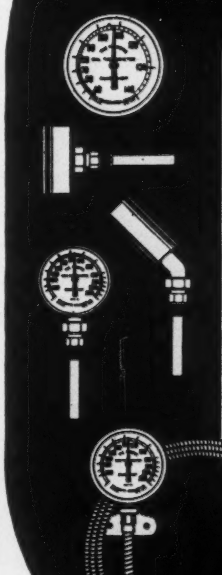

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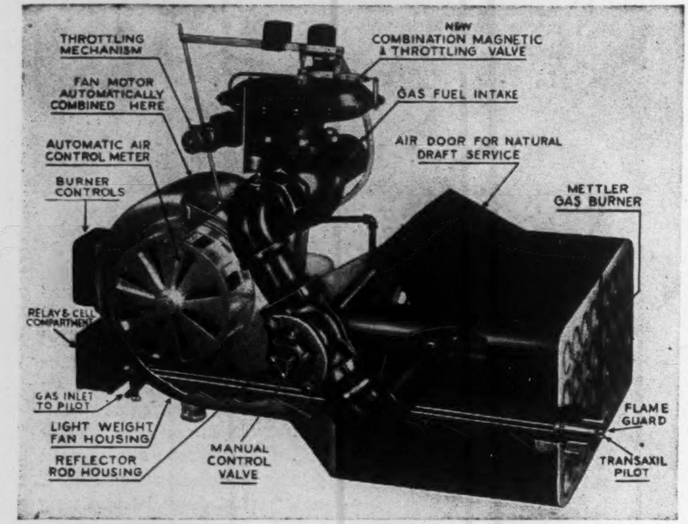

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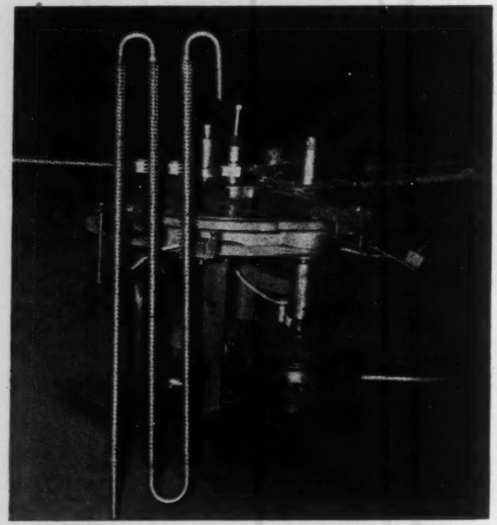

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Write for information on machines to bend finned and plain serpentine coils.

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Steam Traps, Gages, and Other Equipment

No. 4747—8 p. issue of Yarway News (Vol. 1, No. 1) with articles on the impulse type of steam trap, high pressure water gage glass design, operating hints on expansion joints, how to figure sizes of steam traps used on steam mains, metallurgical features of high pressure valves, and other information and data of interest.—Yarnall-Waring Co., Chestnut Hill, Philadelphia 18, Pa.

Turbine Pumps

No. 4748—12 p. bulletin (W-324-B2) on regenerative turbine pumps for general water service, cooling towers, boiler feed, condensate, circulation systems, washing systems, drinking water supply, gasoline transfer, volatile liquids, etc. Construction features are illustrated and described and rating tables and dimensions are given.—Worthington Pump & Machinery Corp., Harrison, N. J.

Valves

No. 4749—11 in. by 17 in. chart, printed on heavy stock for posting, giving 11 tips on the handling and care of valves, graphically illustrated. The chart stresses the protection angle by pointing out the common mishandlings that often reduce valve life.—Reading-Pratt & Cady Division, American Chain & Cable Co., Inc., Bridgeport, Conn.

Water Cooling

No. 4750 — 42 p. bulletin (806) on the fundamentals of water cooling, profusely illustrated with numerous photographs, sketches, and charts. There are discussions of the purposes and means of atmospheric water cooling, wet bulb temperature, operating terms, cooling range, mechanical terms, the principal types of atmospheric water cooling equipment, recirculation of used air, pump cost, mechanical and natural draft, cooling tower fans, water supply piping, wood parts and framing, basins and sumps. There are also large diagrams printed in several colors showing typical applications and showing the flow. Numerous construction details are sketched and advantages of the manufacturer's designs are shown.—Marley Co., 3001 Fairfax Rd., Kansas City 15, Kans.

Weather Control for Radiant Heating

No. 4751—12 p. bulletin on weather control for hot water and radiant heating, describing in detail the manufacturer's mechanical control, giving typical hookups, and showing various installations. Data on roughing in dimensions, air eliminators, and balancing elbows, and capacity charts, are included.—Sarcotherm Controls, Inc., 222 W. North Bank Drive, Chicago 54, Ill.

Welding Fitting Dimensions

No. 4752—Pocket size dimensional data chart giving complete quick layout information on each of the manufacturer's welding fittings and flanges. The 9 in. by 24 in. charts "are ideal for spreading out on a drawing board or desk, and can be folded up into a 9 in. by 4 in. folder to slip into the pocket."—Tube Turns, 238 E. Broadway, Louisville, Ky.

Welding Fitting Working Pressures

No. 4753—18 p. booklet on allowable working pressures of welding fittings for power piping, oil piping, district heating piping, gas and air piping, and refrigeration piping, in accordance with ASA specifications. —Tube Turns, 238 E. Broadway, Louisville, Ky.

Welding Fittings for Marine Use

No. 4754—48 p. catalog (112) covering welding fitting dimensions specified in naval and maritime shipbuilding and with dimensional data on seamless wrought steel and wrought iron fittings, and on wrought carbon molybdenum alloy steel fittings. The booklet is fully indexed and is complete with cross section illustrations of each fitting.—Tube Turns, 238 E. Broadway, Louisville, Ky.

Welding Positioning Equipment

No. 4755—4 p. bulletin on advantages of welding positioning equipment used with automatic welding, illustrating some of the manufacturer's standard and special welding and assembly fixtures. — Ransome Machinery Co., Sub. of Worthington Pump & Machinery Corp., Dunellen, N. J.

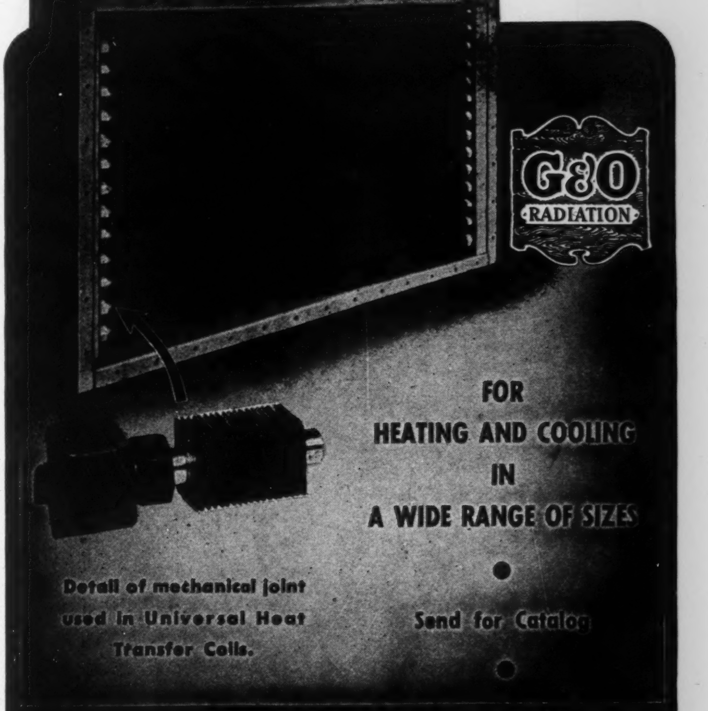
• *NEW BOOKS & REPORTS* •

Explosive Characteristics of Plastics Powders

A study of the explosive and inflammable characteristics of the numerous powders used in the manufacture of plastics has been completed by the Bureau of Mines in connection with a program to further safety measures in an industry believed destined for postwar expansion, Dr. R. R. Sayers, director of the bureau, advised Secretary of the Interior Harold L. Ickes last month.

During the processing or manufacture of some of the plastic materials, the hazards of dust explosions and fires are a constant menace, Dr. Sayers said. Thus far, major plastic dust explosions have been few, but minor explosions have been many as the volume of production has increased, he reported. In the last year or two, several manufacturers of plastic compounds, as well as insurance companies, have taken the precaution to submit numerous powder samples to the Bureau of Mines for explosibility tests.

In the study, which followed similar investigations on metal powders, bureau physicists Irving Hartmann and John Nagy, of the Pittsburgh station, conducted explosibility tests on 57 powder samples to provide technical information for the dust explosion hazards committee of the National Fire Protection Association, which organization is engaged in the preparation of a safety code for the plastics industry. Results showed that of the 57 powders examined—including 31 synthetic and natural resins, 15 molding powders, four ingredients of synthetic resins, and seven fillers of molding compounds—all but three could be ignited and would propagate flame when brought in contact with a heated surface of sufficient temperature, Dr. Sayers



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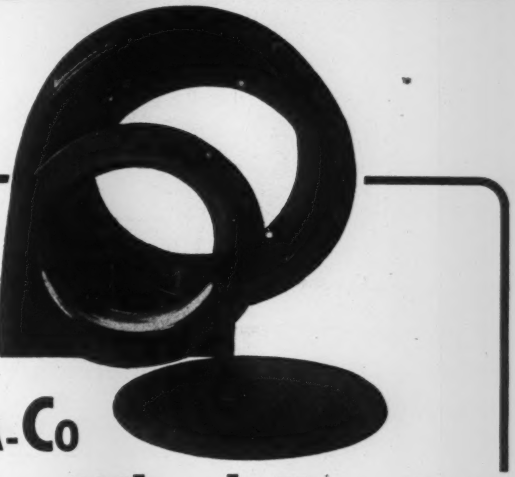
New Haven, Connecticut
Pioneer Manufacturers of Square Finned Tubing in the United States



De-Sta-Co

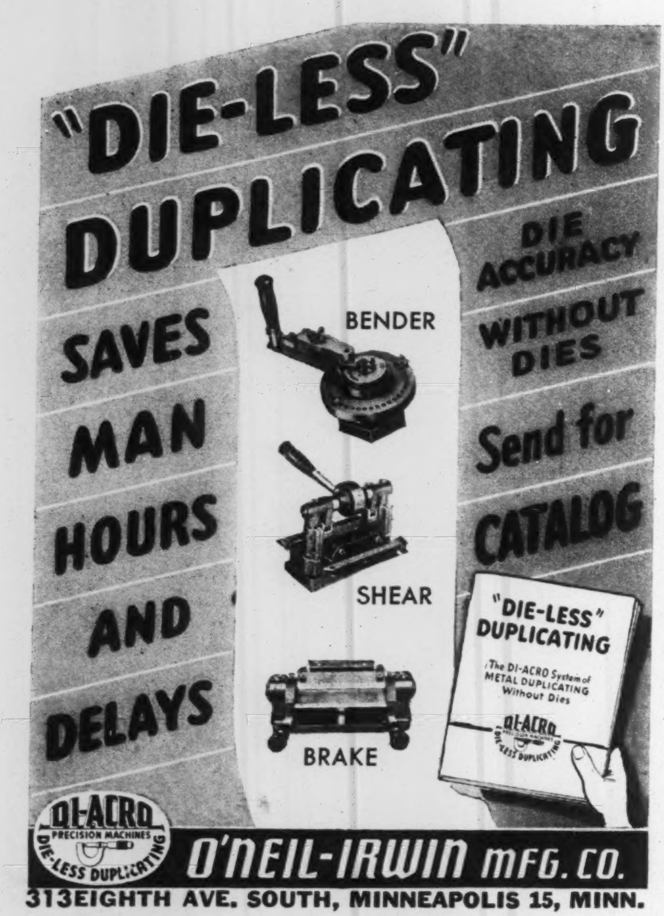
Blower Wheel Housings

of Standard Dimensions

Made in sizes to fit 4½, 5, 6, 7½ and 9 inch wheels and in widths to suit single or double inlet wheels . . . also individual parts for your own assembly.

De-Sta-Co housings are engineered for maximum efficiency and quietness in operation . . . neatly finished. Send for "De-Sta-Co Blower Housings" bulletin; gives complete information, including essential dimensions.

DETROIT STAMPING CO.
Established Over 25 Years
337 Midland Ave • Detroit 3, Mich.



"DIE-LESS" DUPLICATING
SAVES MAN HOURS AND DELAYS
DIE ACCURACY WITHOUT DIES
Send for CATALOG
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"DIE-LESS" DUPLICATING
The DI-ACRO System of METAL DUPLICATING Without Dies
DI-ACRO PRECISION MACHINES DIE-LESS DUPLICATING
O'NEIL-IRWIN MFG. CO.
313 EIGHTH AVE. SOUTH, MINNEAPOLIS 15, MINN.

NEW
Low Cost Regulator
Will Not Rattle . . .
STAYS in Position
The Dial Damper Regulator No. 13 utilizes a new regulating mechanism instead of the finger tip control plunger. This popular and dependable type regulator is built for those jobs requiring a sturdily constructed regulator that embodies positive control features at a reasonable price. It is being used and recommended by some of the largest wartime shipbuilders.

The Dial Damper Regulator No. 13 will fit any size pipe, round or square. It is extremely light in weight, simply installed in a few minutes without special tools. Open and shut positions made by moving handle from left to right. Position held positive by tightening wing nut on handle. Will not rattle . . . stays in position always! Write for details.

MARTENS & STORMOEN
15 HATHAWAY ST. BOSTON, MASS.

reported, and all except seven could be ignited by comparatively weak electric sparks.

Explosibility increases greatly as particle size is reduced, and many fine powders used in the plastics industry were found to be only slightly less explosive than the most hazardous metal powders, such as magnesium and aluminum, the bureau director said. The potential dust explosion hazard in the manufacture of many plastic powders, he said, is greater than that of the common carbonaceous dusts, such as those of coal or corn starch.

The danger of dust explosions in closed grinding and other manufacturing equipment can be reduced, the report said, through the use of inert gas, composed of mixtures of carbon dioxide and air or nitrogen and air, in which the oxygen content is held below certain determined limits. Other important safety measures cited included the elimination of all sources of ignition—electric sparks of static or other origin, open flames, overheated bearings and other hot surfaces—and strict maintenance of good housekeeping to prevent the dissemination of powder and formation of dust clouds.

The report suggested adherence to the recommendations to be presented in the safety code being prepared for publication by the NFPA.

A copy of the bureau publication may be obtained by writing to the Bureau of Mines, Department of the Interior, Washington 25, D. C., for Report of Investigation 3751, Inflammability and Explosibility of Powders Used in the Plastics Industry, by Irving Hartmann and John Nagy.

Chemical Engineering Nomographs

A first scanning of the contents of Chemical Engineering Nomographs, by Dale S. Davis, mathematician, Wyandotte Chemicals Corp., almost leaves one incredulous that so much science, engineering, and industrial practice can be compressed into a few scales. Upon recovering his equanimity on that score, the reader promptly loses it again in observing the wide range of application which Mr. Davis covers in illustrating the usefulness of nomographs. Any engineer will find in the book nomographs of interest, but the heating and air conditioning engineer perhaps will strike as rich a find as any other.

There are in the book chapters dealing with nomographs for flow of fluids, fuel analysis and calorific values, heat transfer coefficients, pH, viscosity, humidity and evaporation, and thermal conductivities of fluids. In all these cases, calculations involving many variables are reduced to the simple mechanical operations of locating factors on scales and drawing lines to an intersection that gives the desired information.

Besides the very practical nature of the nomographs above cited, more abstruse and scientific charts are also given: vapor-pressure-temperature-concentration nomographs. Then there are the practical charts required by other industries: paper making, milk and cream, miscellaneous textiles, etc.

Mr. Davis has presented in this work a very useful tool, for he not only supplies the charts ready for use, but gives explanatory information and instructions regarding their use. For the guidance of those who desire to construct their own charts for particular problems, the author suggests the companion text, Empirical Equations and Nomography (McGraw-Hill, 1943). Chemical Engineering Nomographs contains 311+ix pages, 6x9 in., and 201 charts or nomographs. The publisher is McGraw-Hill Book Co., 330 W. 42nd St., New York, N. Y. The price is $3.50.—K. S.

Mineral Wool High Temperature Commercial Standard

New production of mineral wool effective from May 25, 1944, under commercial standard CS117-44, entitled Mineral Wool: Blankets, Blocks, Insulation Cement, and Pipe Insulation for Heated Industrial Equipment was announced recently by the National Bureau of Standards, U. S. Department of Commerce. Well over 300 firms, government agencies and users accepted the specifications as their standard of practice in the production, distribution and use of mineral wool and its products. The standard was formulated in cooperation with the specifications committee of the Industrial Mineral Wool Institute.

The protection the standard affords the user through both its material and installation specifications is a factor which, it is believed, power and process engineers will welcome. During the formulation of its material and installation requirements, clearness of explanation and simplicity of illustration were given much attention in order to assure understandability. As a result it has been possible to clearly indicate the easy, step by step application procedure which will permit maintenance men as well as contracting applicators and plant engineers to install the products without difficulty.

The application of the various forms of mineral wool products has been further amplified by 19 cross section drawings which illustrate the ease with which each product can be applied either alone or in combination with others. Thickness tables by individual products suitable at various temperature limits and by temperature ranges up to 1600 F are given and thermal conductivity is specified for each product at various mean temperatures in conjunction with density requirement.

Until CS117-44 is printed by the Government Printing Office, a mimeographed copy of the standard will be supplied free by the Industrial Mineral Wool Institute, 441 Lexington Ave., New York 17, N. Y., when requested on company letterhead stationery, for as long as the supply lasts.

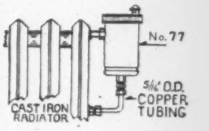
Temperature Drop in Ducts

Bulletin No. 351 of the Engineering Experiment Station, University of Illinois, Urbana, Ill., is entitled Temperature Drop in Ducts for Forced Air Heating Systems, and is a report by Alonzo P. Kratz, Seichi Konzo, and Richard B. Engdahl, of an investigation conducted by the station, in cooperation with the National Warm Air Heating and Air Conditioning Association. The price of this bulletin is 65c, although a limited number of copies is available for free distribution.

GET THAT AIR OUT OF THERE

And Keep It Out With

AUTO-VENT AIR ELIMINATORS



Venting Cast Iron Hot Water Radiator

Circulation Troubles?

Don't fight air pockets or traps in hot or cold circulating lines? "Get that air out of there" *and keep it out* simply by installing the No. 7 Maid-O'-Mist Automatic Air Vent. This reliable air vent has a self-closing float-controlled valve and is designed especially for circulating pipe lines, concealed radiators, unit heaters, cooling manifolds, tanks, diesel engines, or any other application where air pockets or traps retard the free circulation of liquids. Now available in bright brass finish.

APPROVED FOR NAVY, MARITIME COMMISSION AND ARMY USE

MAID-O'-MIST INC.
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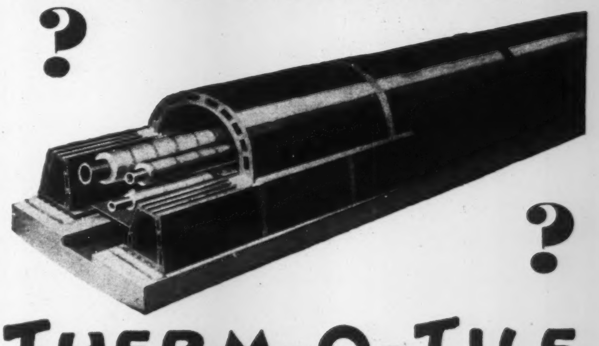
AUTOMATIC HUMIDIFIERS
OF ALL TYPES
HEATING SYSTEMS

How STRONG is



THERM-O-TILE

Reg. U. S. Pat. Off.

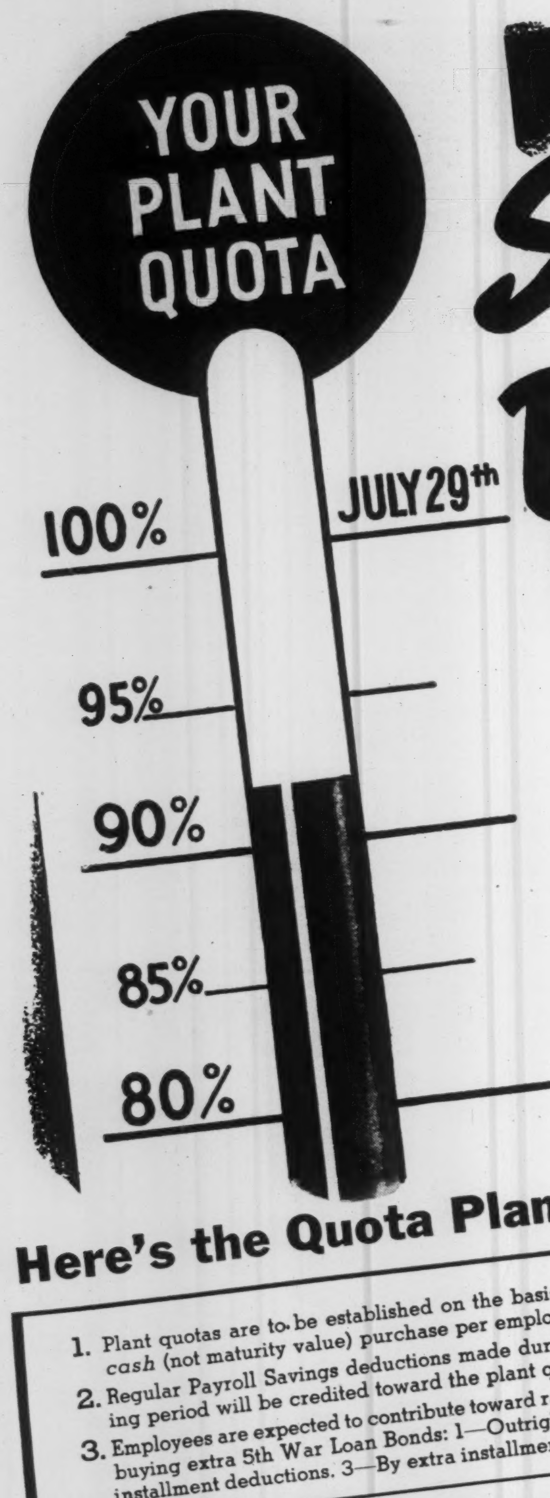
Surprisingly great strength results from the immovable "spread-footing" concrete base of Therm-O-Tile, and the ideal arch construction of heavy tile members. Official unbiased tests show that this underground pipe conduit provides greater strength than is required by A.S.T.M. even for extra heavy tile. Complete data on request.

Sold and installed by Johns-Manville Construction Units in all Principal Cities. See our space in Sweet's or The Heating Guide.

H. W. PORTER & CO., Inc.
822-H Frelinghuysen Ave., Newark 5, New Jersey

Without obligating us in any way, ☐ Please send Bulletin 381. ☐ Send representative. ☐ Enclosed is a sketch, with principal data of a prospective underground piping job, on which we shall be glad to have your ☐ comments, ☐ quotations.

Clip your name, firm, and address to this ad; tear out with the checked squares above; mail; and you will hear from us promptly.



Stay at Your Battle Stations!

MANAGEMENT • LABOR

—the 5th War Loan Drive is still on.

July 29th is the last pay day in the Drive.

The U. S. Treasury has set the overall goal at $16,000,000,000 —$6,000,000,000 from individuals alone. This is the biggest sum ever asked of the American people—*and it must be raised!*

Keep fighting. The 5th War Loan is a crucial home front battle of tremendous importance to the total war effort.

Tighten up your 5th War Loan Drive organization. Step up your solicitation tempo. Drive! Drive!! Drive!!! Hit your Plant Quota's 100% mark with a bang that'll proclaim to all the world that the U. S. Home Front is solidly in back of the Fighting Front. Need help? Need ideas? Call on the Chairman of your War Finance Committee. He's standing by.

Here's the Quota Plan:

1. Plant quotas are to be established on the basis of an *average* $100 *cash* (not maturity value) purchase per employee.
2. Regular Payroll Savings deductions made during the drive accounting period will be credited toward the plant quota.
3. Employees are expected to contribute toward raising the cash quota by buying extra 5th War Loan Bonds: 1—Outright by cash. 2—By extra installment deductions. 3—By extra installment deductions plus cash.

Example: **JOHN DOE MFG. CO.—1,000 Employees**

1,000 Employees x $100 . .	$100,000 Cash Quota
Regular payroll deductions during the eight weekly payroll accounting periods of June and July.	30,000
	$70,000 (to be raised by sales of extra Bonds).

BACK THE ATTACK—SELL MORE THAN BEFORE

5TH WAR LOAN

The Treasury Department acknowledges with appreciation the publication of this message by

HEATING, PIPING and AIR CONDITIONING

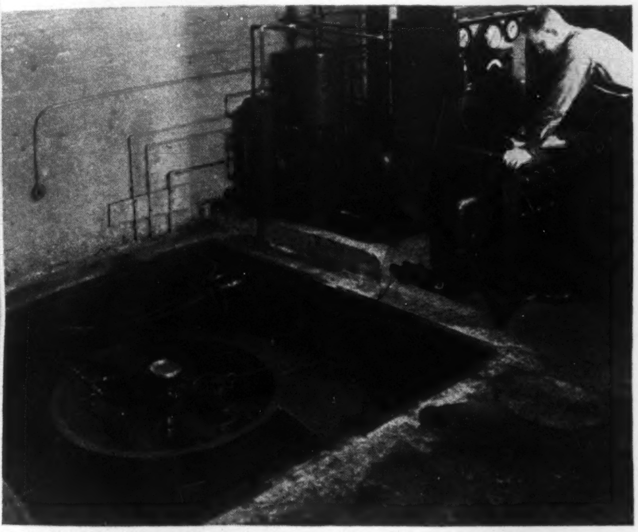
★ ★ *This is an official U. S. Treasury advertisement—prepared under the auspices of Treasury Department and War Advertising Council.* ★ ★

• EQUIPMENT DEVELOPMENTS •

For your convenience in obtaining more information about any of this equipment, see coupon on this page. Add the new products and companies listed here to your Directory Section which you received in your January 1944 Heating, Piping & Air Conditioning and thus keep your records of sources of supply up to date throughout the year. Single asterisk indicates equipment not listed in Directory Section; double asterisk equipment and manufacturer not listed.

Vacuum Test Pit for Fan Impellers

No. 2668—The large vacuum test pit in the research laboratory of the Buffalo Forge Co. is a good example of what is being done to study stresses and improve the quality of high speed rotating machinery. The pit —so termed because the shell is set in concrete below floor level—is 6 ft in diameter by 4 ft deep, and is made of heavy, reinforced construction to withstand absolute vacuum.

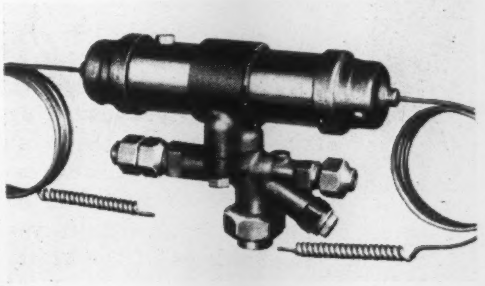


In operation of the test pit, the impeller to be tested is hung by a slender shaft from a small air turbine mounted on the cover. A vacuum pump then exhausts the air from the drum so that it takes practically no horsepower to spin the fan. The pressure within the drum may reach as low as 0.00787 in. of mercury absolute. Under these conditions the power to drive the fan (exclusive of the turbine friction) is about 1/4000 of the power under normal conditions. The acceleration must be gradual, the speed being under the constant control of the operator by means of an air valve and air brake. In order to keep the speed indicating device from absorbing power at the higher speeds, an electronic frequency meter is used. This is a direct reading dial type instrument with suitable amplification.

Several purposes are served by a test pit of this type, says the manufacturer. To insure the safety of operation of cast or fabricated fans, the fan may be run at sufficient overspeed to permit calculation of the factor of safety. On new design the impeller may be tested to destruction in order to determine the weakest section or some unpredictable condition. For this reason there is supplied a laminated shield within the main shell so that the force caused by rupture will spend itself against this shield and not seriously harm the shell which maintains the vacuum. A check on fan balance can be made on high speed impellers that might otherwise be impossible, except at final installation. Thus, a fan that would require 1000 hp to drive normally can be operated by ¼ hp. Then there is an opportunity to study stress conditions while the unit is in operation. A glass aperture in the cover of the pit permits visibility of the impeller by stroboscopic light. Also, through the use of strain gages in circuit with a cathode ray oscilloscope, stresses and vibration may be visualized and measured.

Differential Temperature Expansion Valve

No. 2669—The "No. 793" differential temperature expansion valve illustrated has been especially designed for extreme low temperature applications to give smooth control of refrigerant from —30 to —150 F and below, says the manufacturer. It responds to temperature only and is not affected by pressure in the system, and may be used with any refrigerant not corrosive to brass. Two opposed power elements are employed with capillary tubing and feeler bulbs. One bulb, located at the inlet to the evaporator immediately adjacent to the valve outlet, is identified as the evaporator bulb, and the other, located at the evaporator outlet, is known as the superheat bulb. The difference in temperature between these two bulbs governs the flow of refrigerant through the valve to keep the evaporator fully refrigerated during compressor operation. The superheat adjustment is set at the factory at 8 to 10 F, but this can be changed in the field if necessary.—Detroit Lubricator Co., 5900 Trumbull Ave., Detroit 8, Mich.



Electronic Recorders Released

No. 2670—Release of an electronic circular chart electric controller for plants making either war or civilian goods has been announced by the manufacturer. It is said to be one of the first of several electronic instruments to be released in quantities "and with no rationing system planned." Of special interest to the metal-

Heating, Piping & Air Conditioning, [8-44]
6 N. Michigan Ave., Chicago 2, Ill.

Please ask the manufacturers to send me more information about the equipment mentioned under the following reference numbers in Equipment Developments and Recent Trade Literature.

(Circle each number in which you are interested)

2668 2669 2670 2671 2672 2673 2674 2675 2676 2677
4756 4757 4758 4759 4760 4761 4762 4763 4764 4765
4766 4767 4768 4769 4770 4771

Name ....Title............

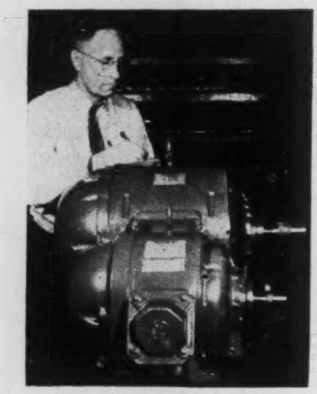
Company ....

Address ....

City ....State..........

lurgical and chemical industries, each model is to have several new features, including a control point index which is in red, and of the same general shape as the black temperature pointer.—Brown Instrument Co., Div. of Minneapolis-Honeywell Regulator Co., 4534 Wayne Ave., Philadelphia, Pa.

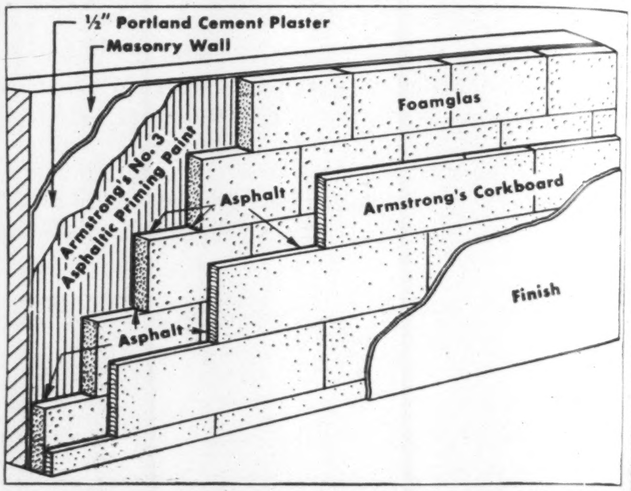
Electrical Insulation



No. 2671**—Sand, brine, coal, and oil provide the basic elements for opening a new field of chemical manufacture to produce silicones, materials which are of far reaching industrial importance, according to the manufacturer. They are the result of extensive research to utilize silicon and oxygen—the elements of which sand is composed—in the production of new temperature resistant materials. High temperature insulating resins are among the most important of the silicone materials, but silicones can be produced either as solids or liquids "in an infinite variety of forms." According to engineers of the Westinghouse Electric & Mfg. Co., unusual success in building lighter and better electrical equipment through the use of these silicone insulating materials has been achieved. In one case, a 3 hp motor was redesigned to provide an output of 10 hp by using high temperature resisting silicones for the electrical insulation. The two motors shown in the illustration each produce the same horsepower, without increasing operating speed, the reason for the increased power in the small motor being the use of silicone insulation, which withstands higher operating temperatures.—Dow Corning Corp., Midland, Mich.

New Low Temperature Insulation

No. 2672—A new type of low temperature insulation construction that is positively and permanently sealed against moisture infiltration, has been developed, according to the manufacturer's announcement last month. It combines corkboard with "Foamglas" to take advantage of the best properties of both materials. Es-


½" Portland Cement Plaster
Masonry Wall
Foamglas
Armstrong's No. 3 Asphaltic Priming Paint
Asphalt
Armstrong's Corkboard
Finish
Asphalt

ARMY E NAVY Award

Zanesville, Ohio, Plant

FOR HIGH ACHIEVEMENT IN WAR PRODUCTION

We are proud, in behalf of the men and women of our Zanesville, Ohio, Plant, to accept the Army-Navy Production Award for high achievement in the production of materials needed for the War Effort.

We appreciate, too, that this is an honor not lightly bestowed and will endeavor to continue producing to the very best of our ability.

Burnham Boiler Corporation

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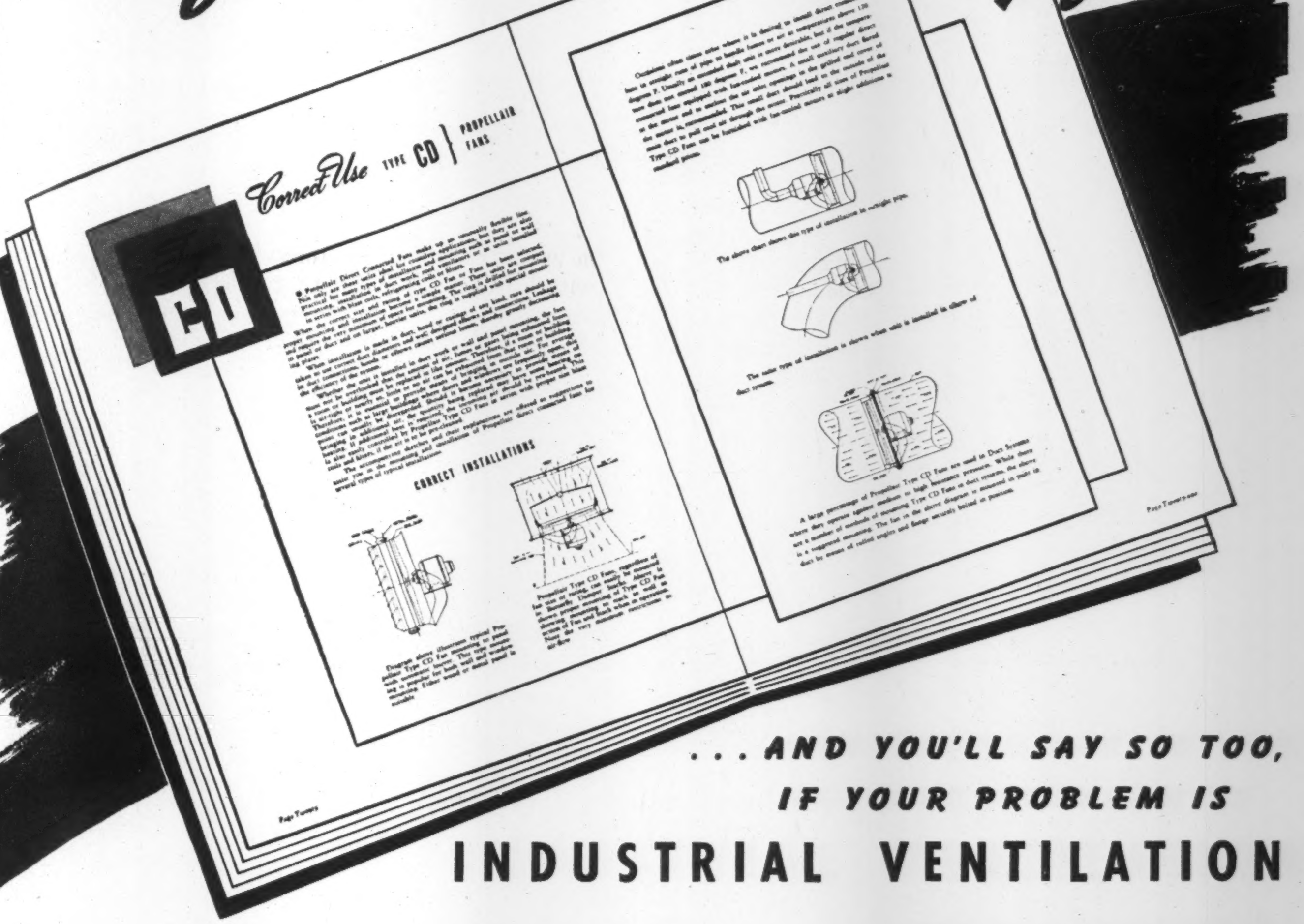
Export Dep't: 50 Church Street, New York 7, N. Y.

"so informative and helpful"


Correct Use TYPE CD } PROPELLAIR FANS
CD
CORRECT INSTALLATIONS

. . . AND YOU'LL SAY SO TOO, IF YOUR PROBLEM IS

INDUSTRIAL VENTILATION

Here is a book as broad in its scope as the growing need for modern industrial ventilation—72 pages of research results by a leader in the field, with facts and figures, tables and charts, presented for quick reference. One busy executive wrote, "In these days when catalogs deluge a buyer like snowflakes in a storm, it is refreshing indeed to receive one that is so informative and helpful." We believe you will say so too, when you see it.

Sections are devoted to propellers, explaining why airfoil design improves efficiency for higher output at lower horsepower; to entrance ring construction, showing how application of the airfoil principle reduces impeding eddy currents; to typical arrangements that overcome flow-retarding obstructions; to recommended air changes for general and specific requirements; to duct design; to dust collection and elimination; to properties and pressure-velocity relationship of air; and to other related subjects important in the solution of industrial ventilation problems.

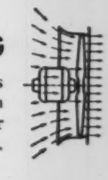
Propellair equipment is serving all industry in correcting poor ventilation; in removing excessive heat, odors, gas, acid and paint fumes, dust, smoke, steam; in cooling and drying products; in cooling workers—and in many other ways. Get the facts. Send for this informative catalog, now! It's yours for the asking. Learn how simple it can be to have really modern ventilation.

EXCLUSIVE PROPELLAIR FEATURES

AXIAL-FLOW AIRFOIL PROPELLERS

Exclusive Propellair design results in airflow that is even over all parts of blade . . . not just tips. Non-overloading propellers give maximum air with minimum horsepower.

CURVED ENTRANCE RING



Eliminates air-flow restrictions almost 100%. Thus, full fan capacity is utilized and more air per horsepower is delivered.

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INC.
"Moving Air Is Our Business"
SPRINGFIELD • OHIO

PROPELLAIR, INC., Springfield, Ohio (HP3)

Please send me the 72-page Propellair book of ventilating information.

Name.................................*Dept*......................

Firm Name..

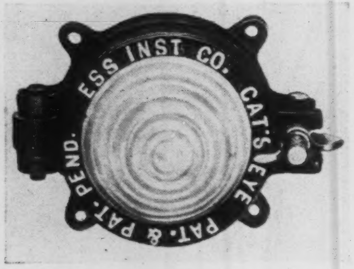
Street Address...........................*City & State*..................

My ventilating problem involves:

☐ Heat ☐ Fumes ☐ Moisture ☐ Dust

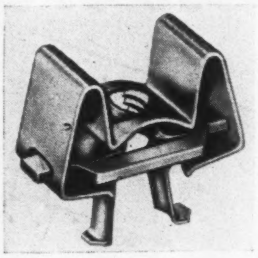
sentially, it is standard corkboard construction with the addition of an outer shell of the glass material to perform the sealing function. This material is in foamed or cellular form "with each tiny cell completely isolated from the adjoining cells, and hence the material is moistureproof, vaporproof, and fireproof."—Armstrong Cork Co., 4400 Concord St., Lancaster, Pa.

Observing Combustion



No. 2673**—A device to aid efficient operation of boilers, known as a "Cat's-Eye," is illustrated. According to the manufacturer, design and construction is such that shadows of the smoke haze and the flame characteristics in the firebox can be seen at a glance from any point in the boiler room, and thus the operator is able to make the necessary adjustments in fuel-air ratio without leaving his station. The center of the device is clear to show the flame in its natural color and the outer frosted portion is a sensitive shadow screen designed to reflect changes in combustion. These devices may be easily attached to burners or peep holes and no adjustments, charts or electrical hookups are required. They are available in three models, one with external lugs, another with internal lugs, and the third threaded for pipe extensions. —Ess Instrument Co., Fort Lee, N. J.

Floating Cage Type Speed Nut



No. 2674—No riveting, welding, or spinning operations, nor any special tools are necessary to install this new self-locking speed nut in screw-receiving position for blind attachments, says the manufacturer. The cage is compressed and the legs are inserted into the clearance hole; the legs spring apart when pressure is released, the turned up ends just clearing the back of the panel. The nut will hold tight against the force of inserting the screw and the screw tightening torque, and the floating speed nut within the cage allows for any misalignment of clearance holes.—Tinnerman Products, Inc., 2018 Fulton Road, Cleveland 13, Ohio.

Electrode for Operation on A-C

No. 2675—A new general purpose electrode for mild steel, designated as "Fleetweld 35" and made specifically for operation on a-c, has been announced. This shielded arc electrode will also operate on d-c with either polarity, depending upon the type of work to be done. It is available in ⅛, 5/32, and 3/16 in. sizes. As-welded weld metal specimen tests have shown tensile strengths from 62,000 to 70,000 psi, yield strengths from 52,000 to 57,000 psi, and ductility (elongation in 2 in.) of 23 to 30 per cent.—Lincoln Electric Co., 12818 Coit Rd., Cleveland 1, Ohio.

No matter how involved your plant layout may be, here is the most efficient solution of your heating problem:

DIRECTHERM

UNIT HEATERS STOKER-FIRED

HEAT MORE SPACE AT LESS COST

LOW INITIAL COST — Saves money the first day
SIMPLE INSTALLATION — No duct work, radiators or pipes needed
LITTLE MAINTENANCE — Automatic controls do the work
WIDE HEAT SPREAD — Heat "fans" out 200 feet
6 SIZES, ALSO FOR OIL AND GAS — 300,000—1,700,000 BTU

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An outstanding Rock Cork quality:

RESISTANCE TO MOISTURE

JOHNS-MANVILLE Rock Cork maintains its original low conductivity in service through its exceptional resistance to moisture. This marked characteristic of Rock Cork may be attributed to its basic composition of mineral wool combined with an asphaltic, waterproof binder. Highly efficient service is still being obtained today from installations made more than 35 years ago. In addition to the above, here are other important advantages:

EXTREMELY LOW CONDUCTIVITY
WILL NOT ABSORB ODORS,
IMMUNE TO MOLD, CAN'T ROT
RESISTS TERMITES, VERMIN
DOES NOT EMBRITTLE
SHRINKS LESS THAN STEEL
QUICK AND EASY TO APPLY

For more information, write for brochure DS-555. Johns-Manville, 22 East 40th St., New York 16, N. Y.

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DRIVE OUT THE "WOBBLIES"

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DRIVE OUT
Excessive Wear
Vibration
Noise
caused by
Couple-Force Action

The new, but thoroughly proven principles embodied in Bear Dy-Namic Balancing Machines make possible a much simpler, easier, faster, lower-cost method of Dy-Namically Balancing any size rotating part from 4 oz. up to 4,000 lbs.

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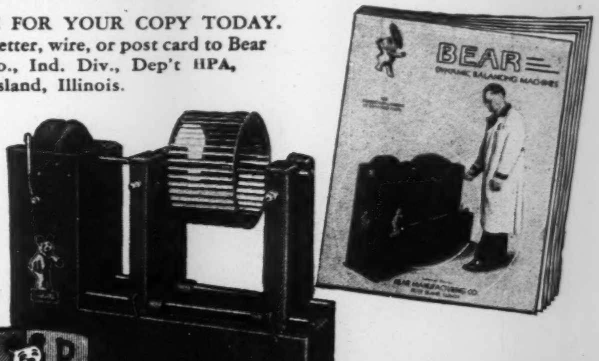
embodying *many important advancements and refinements.*

Shows how these machines are being used in over 20 *different industries by hundreds of leading companies (names on request).*

Explains *Easier Operation*—why operators require minimum training.

Tells why, though *less expensive,* Bear Dy-Namic Balancing Machines do work equal to that of costlier machines.

WRITE FOR YOUR COPY TODAY.
Send a letter, wire, or post card to Bear Mfg. Co., Ind. Div., Dep't HPA, Rock Island, Illinois.



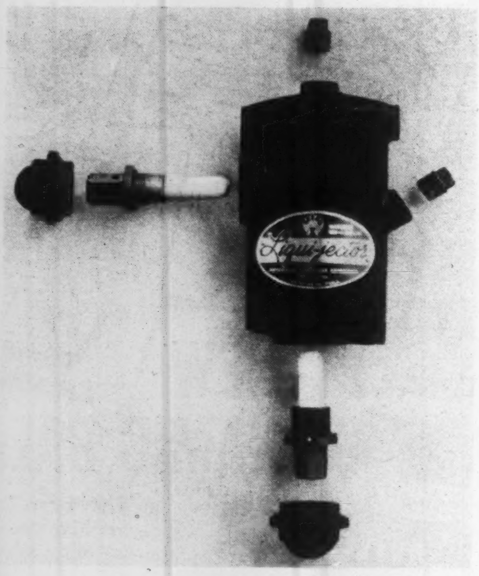
BEAR

COMBINATION

STATIC AND DY-NAMIC BALANCING MACHINES

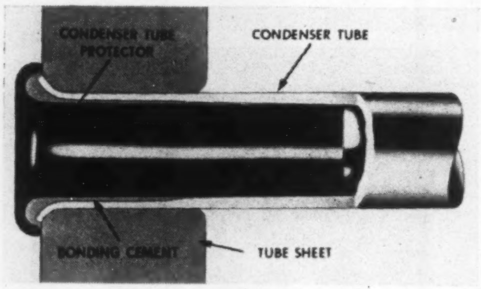
Removing Condensate from Compressed Air and Gas Lines

No. 2676—A new principle for automatically and continuously removing condensate (droplets, slugs, or mist) from compressed air and gas lines is embodied in a family of "Liqui-jectors" adaptable up to 1¼ in. pipe size. No moving parts are involved and no cocks, traps, or shutoffs are required in the drain line, which is open to the atmosphere. Two porous ceramic tubes, one inherently water repellent and the other water permeable but air impervious, are used. The basis of operation is the "automatic operation of the liquid and gas phase by virtue of the surface tension of the liquid." Compressed air entering the unit passes through the first (and water repellent) tube where the moisture is removed, and the moisture drops to the bottom and passes through the second tube, without loss of air, to the outside atmosphere. The unit illustrated is for use up to ⅜ in. pipe size with line pressures up to 100 psi. Applications include pneumatic tools, atmosphere gas generators, compressors, air actuated control systems, vapor quench lines, spray and blast equipment, and other pneumatic apparatus in which moisture may corrode the equipment or damage the work.—Selas Corp. of America, Erie Ave. and D St., Philadelphia 34, Pa.



Condenser Tube Protectors

No. 2677—A line of protectors for guarding condenser tube inlets against the destructive effects of air erosion and sand abrasion was announced last month. Molded of special wear resistant "Bakelite" material unaffected by temperatures to 275, F, they fit inside the inlet ends of the tubes as illustrated, are cemented in place, and provide a bellmouth venturi entrance for the circulating water. These protectors are available for marine and stationary power plant condensers.—Crane Packing Co., 1801 Belle Plaine Ave., Chicago, Ill.

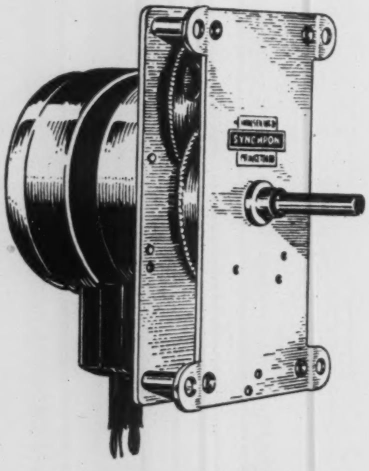


A message of special interest to forward-looking executives, and designers of post-war Timing devices:

SYNCHRON

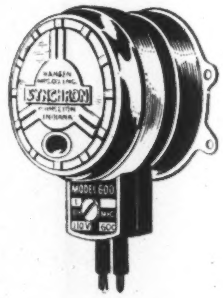
Tiny Timing Motors and Time Machines

have been—and still are—at war, serving with our Navy and Army Air Forces. But, in performing these special war assignments, our engineers have discovered new improvements, and our production facilities have been increased. The results of this war-time research are incorporated in an improved standard line of SYNCHRON Timing Motors, Time Machines, and Clock Movements. And our production is such that we can, and will, give you what you need—as quickly as materials are available . . . If your post-war planning includes miniature synchronous or DC motors, write for the SYNCHRON catalog and outline your power or timing mechanism problems.



The Time Machine

Compact, accurately constructed, powerful enough to operate all types of Timing Controls, yet small enough to fit in the palm of your hand! Operates at standard intervals of 1 RPM, 1 RPH, 1 RP12H, and 1 RPD. Other intervals if desired.



The Timing Motor

Small—only 2¼" in diameter by 1-5/16" deep. Pulls up to 8 oz. direct load continuously at 1 RPM. Brass gears, hardened steel shafts, steel pinions, oil-impregnated double bearings—with sealed-in supply of special oil surrounding all moving parts. Operates at temperatures 40 degrees below zero to 140 above. Standard speeds, from 1 to 300 RPM. Other speeds if desired.

HANSEN MANUFACTURING COMPANY, INC.
PRINCETON 6, INDIANA • *Synchronous Motors Since* 1907

HERE IS HOW VIBRATION TRANSMISSION OF A COMPRESSOR IS STOPPED WITH . . . . . . KORFUND

VIBRATION CONTROL

When Korfund engineers are called in to eliminate troublesome vibration caused by the operation of a compressor, they may recommend any one of a number of solutions. However, there are some conditions which require unusual engineering ingenuity.

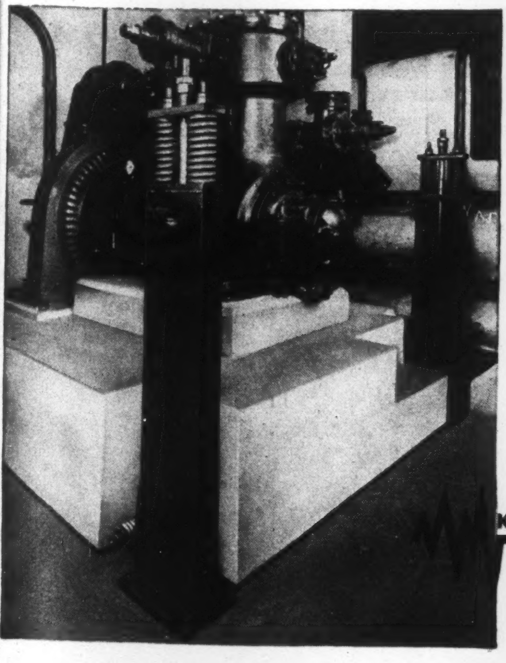
For example: If the compressor unit is a single cylinder or two cylinder machine which is inherently unbalanced, then Suspension Isolators (with or without concrete foundation) are the ideal solution. Smooth and vibrationless operation is obtained with this method whereby machine and foundation are suspended from its center of gravity. This is the closest approach to the "ideal system" which refers to an imaginary system suspended in space and provided with a limitless elastic suspension. A typical example of this type of installation is shown below.

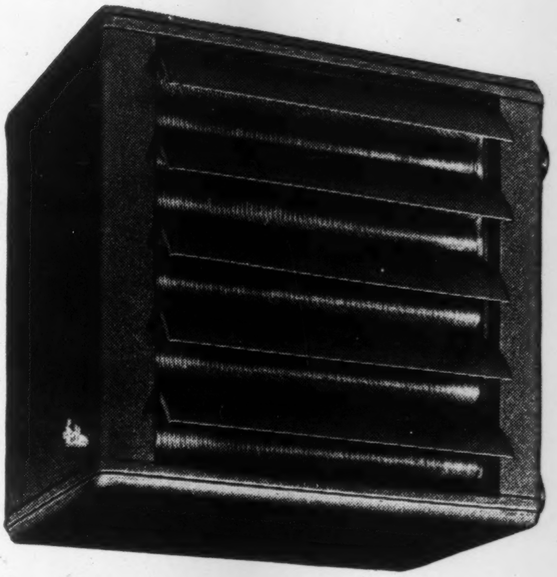
Other types of compressors, commercially balanced but a vibration problem just the same, may be efficiently isolated by one of the Standard Isolator types—an excellent, yet inexpensive means of controlling vibration.

When you bring your vibration problems to Korfund you can be sure of receiving unbiased assistance because Korfund Vibration Control mountings utilize natural cork, rubber, and a wide variety of steel springs as the isolating medium. Korfund engineers are equipped to provide the best possible solution to each vibration problem.

Write for descriptive bulletin. Ask for a copy of Catalog G-100

THE KORFUND COMPANY, INC.
48-36 Thirty-second Place, Long Island City 1, N. Y.
Representatives in Principal Cities





A Word to MEN OF MANAGEMENT

about their POWER PLANT ENGINEER

Your Power Plant Engineer would not tell you this, so we are going to do it for him.

He has been—and still is—going through one of the most difficult periods in his experience. He is working under heavy handicaps of help shortage, difficulty in securing new or operating equipment, fuel shortages, and a host of other conditions which have taxed his ingenuity to the utmost.

He has done his best to keep factory and office workers warm, and our hat is off to him!

As manufacturers of Fedders Unit Heaters, we have made it a policy to smooth the road for heating men by gearing our orders to our production to make possible common sense delivery promises and live up to them during these trying times.

fedders

Buffalo 7, N. Y.
INDUSTRIAL HEATING DIVISION

Manufacturers of Unit Heaters, Blast Heating Coils, Unit Coolers, Electric Refrigeration Equipment, Automotive and Aircraft Radiators, Electric Water Coolers.

Forestall Valve Inaction

with Declutching Unit and Hand Wheel

No. 587
125-pound valve power operated by diaphragm motor. Declutching unit and hand wheel for use in emergencies.

While the majority of R-S Butterfly Valves are manually operated, they are also adapted to power operation. In such power installations, the inclusion of the R-S declutching unit (patent pending) and hand wheel has *four advantages*.

In the first place, if it is desirable to install a manually controlled valve and, at a later date, it becomes advisable to obtain some type of prime mover for automatic control, the prime mover can then be installed in the field.

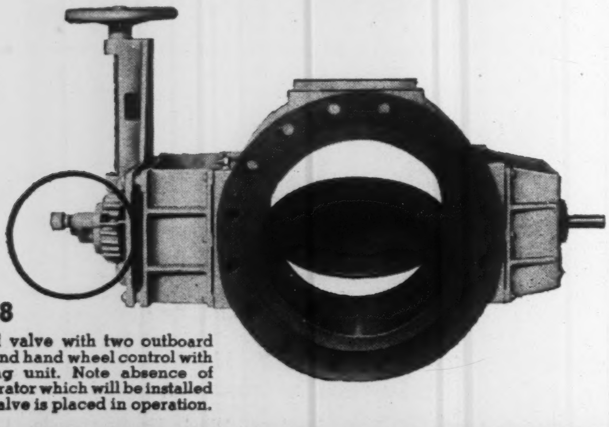
If the delivery date of the prime mover can not be made to coincide with the delivery of the valve, the valve can be installed and operated at once by hand.

A power failure will cause a power operated valve to be inoperative. Such is not the case, however, when a declutching unit and hand wheel are provided.

Likewise, the removal of the prime mover for maintenance, does not result in valve inaction since the valve can be operated manually at any time simply by removing the pull pin from the link which connects the diaphragm reach rod or piston to the link.

Investigate the many advantages of R-S Butterfly Valves **(15 to 900 psi)** and especially the merits of the R-S declutching unit and hand wheel.

VALVE DIVISION
R-S PRODUCTS CORPORATION
132 Berkley Street • Philadelphia 44, Pa.



No. 588
125-pound valve with two outboard bearings and hand wheel control with declutching unit. Note absence of power operator which will be installed after the valve is placed in operation.

R-S *Streamlined* BUTTERFLY VALVES

• NEW BOOKS & REPORTS

Air Conditioning and Refrigeration

Air Conditioning and Refrigeration, by Burges
Jennings, professor and chairman of the depart
of mechanical engineering at Northwestern Univers
and Samuel R. Lewis, consulting engineer and me
of HPAC's board of consulting and contributing edi
is the second edition of a book by the same aut
which was entitled Air Conditioning Principles
Practice, and which was published five years ago.
thorough revision was deemed desirable because of
progress since 1939, and certain parts of the text
been expanded while other parts have been clari
Considerable additional material on refrigeration
been added, so that the second edition can also s
as a textbook on this subject.

As the names of the authors would lead one to
pect, this new edition is well organized, well writ
and quite comprehensive. The aim has been to pres
the concepts and examples from the viewpoint of
principles, and a large number of proofs and deve
ments are therefore included. There are numerous il
trative examples with their solutions, and there are
tables of useful data and 166 illustrations, many
which are charts and graphs.

Chapters are included on the background of air
ditioning, fundamental definitions, air and humid
calculations, air conditioning for human comfort,
transfer, the heating load, cooling load computati
steam heating, hot water heating, warm air heati
fluid flow and air distribution systems, heat trans
elements, boilers, air cleaning, principles of refrig
tion and refrigerants, refrigeration equipment and
rangement, control of air conditioning refrigerat
apparatus, industrial air conditioning, and miscella
ous topics (including testing and costs).

There are 517+xvi pages, 5¾x8¾ in., in this bo
The publisher is the International Textbook Co., Scr
ton, Pa., and the price is $4.50.

Friction Factors for Pipe Flow

The object of a paper on Friction Factors for P
Flow, by Lewis F. Moody, professor of hydraulic
gineering at Princeton University, presented at
semi-annual meeting of the American Society of
chanical Engineers last June, is to furnish the engi
with a simple means of estimating the friction fact
to be used in computing the loss of head in clean,
pipes and in closed conduits running full with stea
flow.

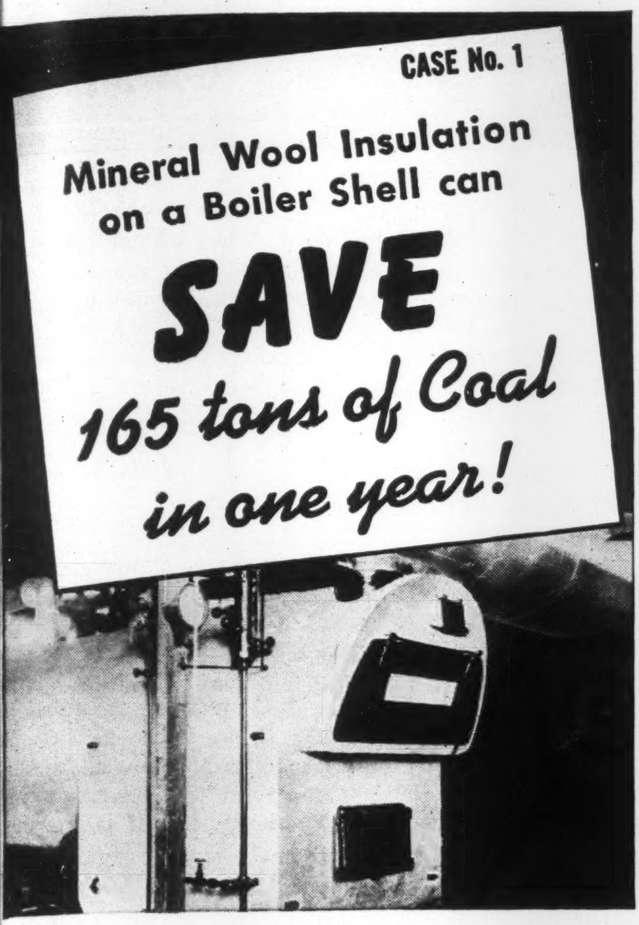
The paper includes a new chart showing the fric
factor versus Reynolds number for various values
relative roughness; and to permit easy selection
the value of relative roughness, there is a chart f
which such values can be read for any size of pip
a given type of surface. The use of these chart
explained in detail. Considerable attention is give
the Colebrook function, and to pipe friction fac
applied to open channel flow.

CASE No. 1

Mineral Wool Insulation on a Boiler Shell can

SAVE

165 tons of Coal in one year!



Free Heat and Power Conservation Manual tells how you can save fuel in your plant. Write for copy

Is there any surface on your equipment too hot to touch? If there is, you need this Manual. It tells you how to step up production and conserve valuable fuel—how to use Mineral Wool Insulation on boiler drum heads, hot storage tanks, ducts and breachings, pipes and fittings, feed water boilers, driers and ovens, flanges, boiler shells and boiler fittings.

Mineral Wool has extra low thermal conductivity. It is light, easy to apply, low in cost. No other insulation does so much for so little.

Cooperate with your government's drive to save critical fuel. Stop heat losses now. Send for your copy of this free manual today. Write to Industrial Mineral Wool Institute, 441 Lexington Avenue, New York 17, N.Y. Dept. H8.

IF IT'S TOO HOT TO TOUCH

IT NEEDS INSULATION

☆ ☆ ☆

Mineral Wool Insulation is also effective for controlling cold temperatures and is an excellent fire-retarder.

MINERAL WOOL INSULATION PRODUCTS for high and low temperatures

BLANKETS · FELTS · BLOCKS · CEMENTS · PIPE COVERINGS · FILL MATERIALS

---

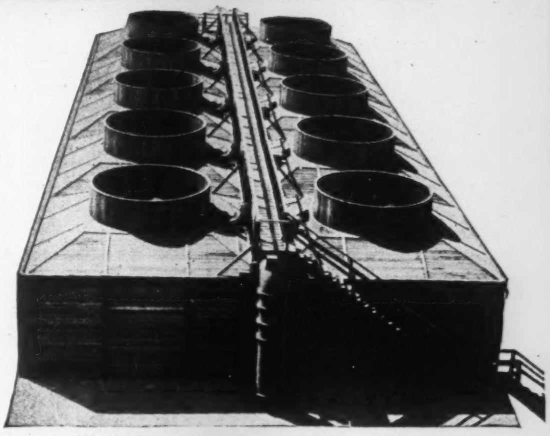
the SOURCE *of* PRE-TESTED PERFORMANCE *in* COOLING TOWER DESIGN

46 YEAR
RECORD
of
L-H
INSTALLATIONS

the REASON

"The proper coefficients for reducing (cooling tower) theory to practice are known by few ... knowledge can be obtained only through long years of practice ... observation of results produced by various installations ... with varying atmospheric conditions ... under different bases of efficiency."

Typical APPLICATION



Installed for War Department at large government arsenal for condenser water cooling.

Type: 10-cell Induced Draft Tower, back-to-back construction.

Construction Features: Independent operation of individual, or cell groups. Motors located out of air stream. Redwood discharge stacks prevent recirculation.

Capacity: 13000 GPM . . . 20 degree range.

NOTE: No leaks in tower casing...watertight wall construction. Photographed after 14 months operation.

LH

Lilie-Hoffmann COOLING TOWERS, INC.

Manufacturers of All Types of Water Cooling Towers

GENERAL OFFICE: 4239 DUNCAN AVENUE, ST. LOUIS, MO.
PLANTS AT ST. LOUIS, MISSOURI AND PLAINVIEW, TEXAS

Natural air movement does it . . . gets heat, smoke and fumes out of factory buildings . . .

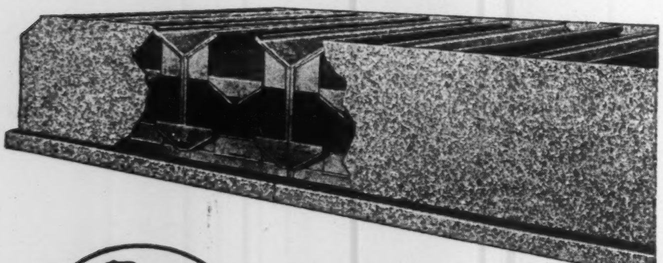
Swartwout
AIRMOVER
does it easily, economically

● Building owners, engineers and plant managers welcome the AIRMOVER for its adaptability to all roof conditions, its efficiency in handling large volumes of heat-motivated air, its pleasing appearance and low height (only 32" high). AIRMOVER gives you low cost ventilation without complicated structural layouts.

In most cases you need no extra structural members for the AIRMOVER. Installation cost is extremely low. For unusual flexibility, any installation can be custom built if necessary to fit special conditions, although standard units usually fill the need.

Here's the way to get results in large-scale ventilation—results that give you a reputation for knowing the latest and best methods. Before you plan your next job, ask for information on the Swartwout way of adapting *natural* ventilation to the conditions you have to meet.

**THE SWARTWOUT CO., 18511 Euclid Ave.,
Cleveland 12, Ohio**



LIKE
OPENING
YOUR ROOFS
TO THE SKY

Swartwout

Specialists in Air Movement
by *Natural* Methods

● WPB . . . OPA . . . PAW . . . Etc. ●

ALUMINUM—Rules permitting wide, new uses of aluminum for essential products were announced July 15 by the War Production Board. They include provisions for substitution of aluminum, now in relatively free supply, for other metals and critical materials not so readily available. The rules, together with the lifting of restrictions on the use of magnesium announced at the same time, conform to recent decisions of WPB to lay the groundwork for eventual conversion of industrial production to peacetime output, at the same time assuring that war demands are met, WPB said. (Supplementary order M-1-i).

ALUMINUM AND MAGNESIUM—Shifting of the position of aluminum and magnesium from group II, the list of materials currently in balance between supply and demand, to group III, the materials that exceed current war and essential industrial needs, is the outstanding feature of issue No. 13 of the material substitutions and supply list released by the conservation division of the WPB July 21. Group I lists materials in insufficient supply for essential requirements. The list is designed to guide industry in the conservation of critical materials through substitution of less critical ones.

BOILERS—A recommendation that steel boilers be removed from scheduling restrictions was made at a meeting of the steel boiler industry advisory committee, WPB reported July 20.

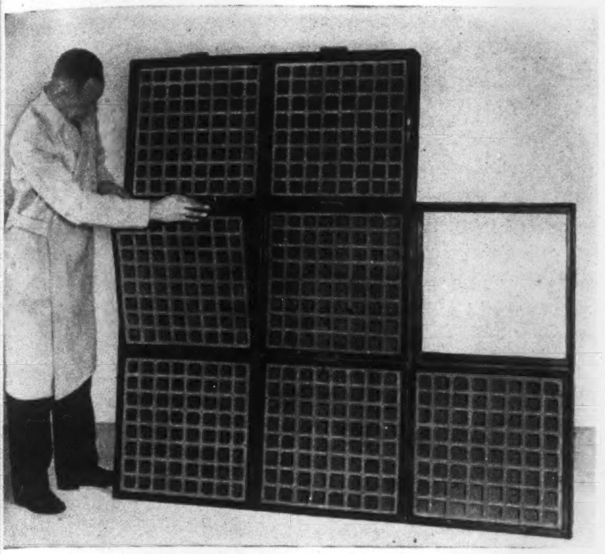
COAL—A Solid Fuels Administration survey of the first quarter of the "coal year" shows that the bituminous mining industry, with the aid of wartime measures, has cut the threatening soft coal deficit to 16,000,000 tons, but the nation still faces a critical coal problem, Secretary of the Interior Harold L. Ickes said July 14. A 30,000,000 ton deficit threatened on the basis of trends early in 1944. The lack of facilities for increasing anthracite production is expected to prevent any material reduction in a tentatively estimated 5,000,000 ton shortage of domestic sizes of hard coal.

COAL—Householders and other retail consumers of domestic sizes of scarce Southern Appalachian-mined bituminous coals will be limited during coming heating season to not more than 90 per cent of their annual requirements of such fuel under new wartime distribution regulations announced July 22 by Office of Solid Fuels Administrator Harold L. Ickes.

CONSTRUCTION ACTIVITY—Construction activity in U. S. during first half of this year showed first break in long monthly series of decreases in evidence since August 1942, WPB said July 25.

CONSTRUCTION—Amplification of the description of the kind of construction work covered by paragraph (b) of order L-41, providing a more detailed definition of "the installing of equipment and fixtures," was made by the WPB July 8. This action was accomplished by issuance of interpretation 9, which specifically states that certain kinds of installations are construction and are governed by the restrictions of L-41. The following kinds are listed: "The installation of any piece of equip-

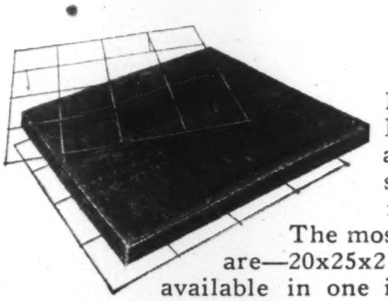
RESEARCH AIR FILTERS



for FILTER BANKS and INDUSTRIAL DUST COLLECTION

Research Air Filters are now used in leading office buildings, theatres, banks, department stores, clothing stores, restaurants, factories, and homes. They filter the air for crack streamline trains. Research Air Filters have proven their efficiency in industrial dust removal, central air conditioning, ventilating systems, railroads, forced warm air furnaces, unit air conditioners, paint spray booths, and air intakes on diesels and air compressors.

No. "200" Series Filter



Research Air Filters are available for all standard sized filter banks. The most popular sizes are—20x25x2; 20x20x2. Also available in one inch thickness.

RESEARCH PRODUCTS CORP.

1015 E. Washington Ave. Madison 3, Wis.

ADSCO – BANNON
THE PERMANENT TILE CONDUIT

FOR TRANSMITTING STEAM FROM A DISTRICT OR CENTRAL STEAM HEATING PLANT

... to a building or group of buildings
... to an entire business or residential district

Made of vitrified clay tile. Installed with "Fiberglas" insulation. A Combination that can't be topped for permanency or efficiency.

Can be furnished for several combinations of pipe in the same conduit, thereby reducing cost.

ADSCO-Bannon Tile Conduit is a reasonably priced easy-to-install conduit equally good for the rush job to give temporary service, just as it is ideally designed to provide a permanent installation for a post-war industrial, college or institutional project comprising one or more buildings.

Split tile construction makes it easy to install a group of pipes. Pipes can be threaded or welded where you can get at them, then let down in place. Highly skilled labor not required.

Base drain carries away ground seepage water — keeps insulation dry — prevents undue heat loss.

Send us details of proposed installations for prompt quotation or write for illustrated bulletin No. 35-67HP.

POST WAR NOTE: Communities that install District or Central Heating for business or residential sections will provide needed employment — save fuel — eliminate furnace and boiler tending — enjoy cleaner buildings — reduce fire hazard and smoke nuisance — eliminate coal handling and ash removal.

AMERICAN DISTRICT STEAM COMPANY NORTH TONAWANDA, N. Y.

Making "UP-TO-DATE" Steam Line Equipment for over 60 years ment or fixture which is attached to the plumbing system of a building; the installation of any piece of equipment or fixture which involves putting new wiring in a building; the installation of any piece of equipment or fixture for which a base or foundation must be built; the installation of any piece of equipment or fixture cemented to a floor or wall of a building; the installation of a furnace or stoker connected by pipes or flues or wiring to the building." Interpretation 8 to order L-41 was also issued in connection with the installations and relocations of equipment in certain large plants.

FUEL—Supplies of coal, fuel oil, and wood will remain tight through 1944 and into 1945, the Office of War Information said July 17 in a report based on data supplied by the Solid Fuels Administration for War, Petroleum Administration for War, Office of Price Administration, Office of Defense Transportation, War Production Board, the Forest Service of the U. S. Department of Agriculture, and the Bureau of Labor Statistics. The WPB has made controlled supplies of steel, copper, and aluminum available for the manufacture of heating system controls because of the expected fuel shortage. Released materials, to be used in manufacturing heating controls during the third and fourth quarters of 1944 for use in some 950,000 residential, commercial, institutional and industrial heating plants, include: carbon steel, alloy steel, copper base alloys, copper base and wire mill and foundry products, and aluminum, the OWI said. Early ordering of fuels, preparation of buildings for winter by installation of storm doors and windows and insulation, economical use of fuels during the heating season, are measures consumers should take to relieve the shortage of fuel, according to government agencies concerned with production and distribution of fuels.

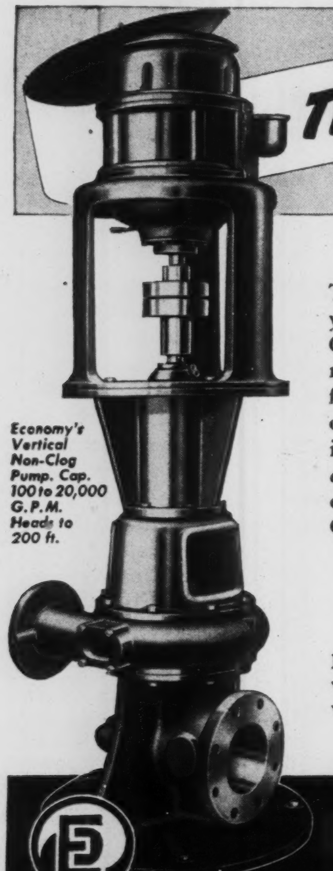
FURNACE PARTS—Manufacturers of furnace repair parts will not be required to publish new price lists for such parts to be able to charge the 9 per cent increase in prices granted June 24, 1944, the Office of Price Administration announced July 22. In the case of repair parts only, manufacturers may use the optional method of increasing prices by decreasing discounts extended to various classes of purchasers by an amount resulting in a net increase of not more than 9 per cent of the published list price in effect on August 3, 1943.

HEATING AND PLUMBING EQUIPMENT—Dollars and cents ceiling prices have been set for 65 used and reconditioned plumbing and heating items, and maximum prices provided for most others by applying a specified percentage discount from the manufacturer's list price for the article when new, the OPA announced July 15. The regulation (MPR No. 546, effective August 9, 1944) covers sales at both retail and wholesale with prices based generally on March 1942 levels.

HOSPITALS—Brig. Gen. Frank T. Hines, Administrator of Veterans' Affairs, announced July 5 the Veterans Administration has recommended that the Federal Board of Hospitalization approve new building projects totaling 16,000 additional veterans' hospital beds, to be constructed in 20 different states. General Hines said that other recommendations will be made for additional veterans' beds as fast as the need for them develops. The 16,000 bed program recommended consists of three types of permanent fireproof modern hospitals as fol-

TROUBLE FREE SERVICE

... Year in, Year out



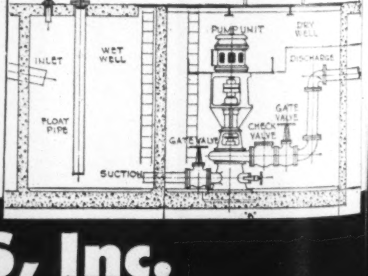
Economy's Vertical Non-Clog Pump. Cap. 100 to 20,000 G.P.M. Heads to 200 ft.

TypeSSV Vertical Sewage Pump in open shaft setting. Non-Clog construction.

That's what you can expect, and will receive if you specify Economy's "Sure-Flow" Vertical Non-Clog Pump. Especially designed to pass solids, rags, sewage and trash *without vibration* or whip from shock of temporary unbalance by heavy objects entering the impeller. Motor is mounted in a yoke directly above the pump and *flexibly coupled* to the pump. The pump has its own heavy duty bearings and separate shaft. Economy Non-Clog Pumps are ideal for:

- Sewage Disposal
- Underpass Drainage
- Food Industries
- Chemical Industries
- Paper Mills
- Sludge Removal
- Overflow Service
- Reduction Plants

If your problems fall in any of these applications—write today for Bulletin F534. It tells a story well worth reading.



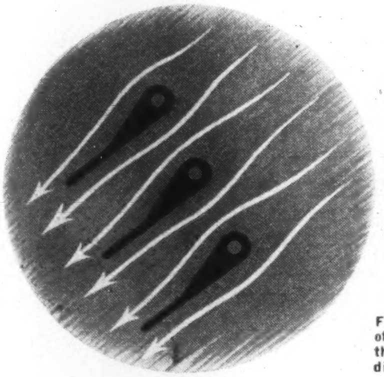
Typical installation of Vertical Non-Clog Pump in shallow well.

ECONOMY PUMPS, Inc.
HAMILTON, OHIO, U. S. A.

Quiet

AIR DIFFUSION

—even at high velocity



For positive control of air distribution these blades are individually adjustable.

WITH THESE EXCLUSIVE *streamlined* BLADES

Streamlined blades are used to obtain unobtrusive air diffusion. The exclusive shape of these blades allows them to handle high-velocity air with a maximum of efficiency and a minimum of sound. The spacing of the blades provides the required free area.

Waterloo AIR DIFFUSERS

Efficient Registers and Grilles are invaluable to satisfactory heating or air conditioning. FLEXIBILITY in control and diffusion of the air stream is especially important—to permit prompt adaptation to changing conditions. Such flexibility, coupled with quiet operation (even at high velocities), is an exclusive feature of Waterloo Air Diffusers.

Today, Waterloo's skill in precision manufacturing is engaged in important War production. When the war is over—plan to use these products for BETTER heating and air conditioning results.

Waterloo Register Co.

INCORPORATED 1902

WATERLOO, IOWA SEATTLE, WASH.

Dependability doesn't happen...

IT'S *BUILT INTO* EVERY AP VALVE

TRAP-DRI
DRYER - STRAINER - FILTER
THIS END OUTLET

AP "TRAP-DRI"
Refrigeration System-Protector

▶ Troublesome moisture, gummy deposits, scale, dirt, solder particles and other impurities CAN'T affect your refrigerating efficiency—with an A-P "TRAP-DRI" in the refrigerant line!

▶ The first device on the market that combines *both* an efficient filter and an effective dryer, the "TRAP-DRI" offers 100% protection, permitting smoother valve operation and preventing freeze-ups.

▶ The filter element is as effective as a 900-mesh strainer—yet with *no appreciable pressure drop.* The Silica Gel is 1½ to 2 times more effective than other dehydrating agents.

▶ The A-P "TRAP-DRI" belongs on EVERY refrigeration system! It's easy to install.

AUTOMATIC PRODUCTS COMPANY

2460 North Thirty-Second Street • Milwaukee 10, Wisconsin
Export Dept.—13 E. 40th St., New York 16, N. Y.

• • •

Stocked and Sold by Progressive Refrigeration Jobbers Everywhere — Recommended and Installed by Leading Refrigeration Service Engineers.

DEPENDABLE
REFRIGERANT VALVES

lows: 5000 additional beds for neuropsychiatric patients; 3000 additional beds for tuberculosis patients, and about 8000 additional beds for general medical and surgical cases. The program will cost in the neighborhood of $70,000,000.

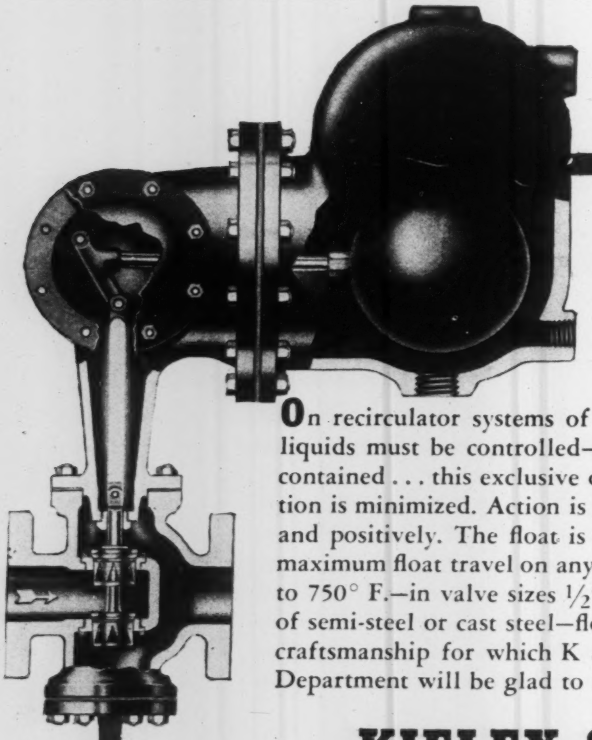
HOUSING—A limited program of housing construction to relieve housing shortages for resident war workers in congested war production areas was announced jointly July 19 by the WPB and the National Housing Agency. Construction under the new program, to be designated as H-2 housing, will be in addition to housing construction now under way to meet the needs of essential in-migrant war workers. New starts under the in-migrant program, designated as H-1 housing, are declining in reflection of the increasing stabilization of war employment in many production areas and the consequent decrease in net in-migration of war labor, WPB and NHA officials said. Current tentative forecasts indicate the starting of several thousand dwelling units under the new program during the remainder of this year, with a probable quarterly volume of approximately 25,000 units during 1945. This would be in addition to housing started under the in-migrant program or to relieve cases of individual hardship.

HOUSING—WPB has issued interpretation No. 1 to directive 24 to make clear the distinction between applications for housing construction handled by the National Housing Agency, WPB, the Department of Agriculture's county war boards and other government agencies, WPB reported July 11. Directive 24, as amended May 24, gave NHA jurisdiction over certain kinds of housing construction. The interpretation explains methods of determining where applications should be filed for new construction or alterations on hotels and on buildings containing both residential and commercial space. The kinds of farm housing, institutional housing, and housing for transient workers that are not handled by NHA are also pointed out. The interpretation contains a summary of certain WPB regulations and orders relating to priorities assistance for repairs of housing.

HOUSING—Construction was completed on 63,222 new privately financed dwelling units for war workers during first half of 1944 under mortgage insurance program of FHA, Commissioner Abner H. Ferguson announced July 22. This compares with 58,649 completed during first half of 1943.

INSULATION—All sales of flameproof cotton insulation have been brought under a single regulation with specific dollars and cents prices listed for five classes of purchasers in three geographical price zones, the OPA announced last month with the issuance of MPR No. 544, effective July 11.

MOTORS—Members of the fractional horsepower electric motor industry advisory committee agreed last month that the industry would be able to resume production of appliance motors within 60 days after military programs are canceled, the WPB reported July 21. The committee recommended that if manufacture of civilian appliances is resumed prior to the cancellation of military programs, orders for civilian purposes be identified in order that manufacturers may be in a position to prevent interference with production of any motors for the war effort.



NO "GLAND TROUBLE"

because UNITROL Level Controller has no packing glands or stuffing box

On recirculator systems of condenser hotwells, deaerators—or wherever the level of liquids must be controlled—UNITROL will do it more accurately! Simple . . . self-contained . . . this exclusive design eliminates trouble-making restrictive elements. Friction is minimized. Action is free and unhampered. Feed or drain is regulated promptly and positively. The float is linked to the inner valve through ratio connection, with maximum float travel on any size valve of only 7 inches. Available for temperatures up to 750° F.—in valve sizes 1/2" to 4"—integral casting construction—valve and floatcage of semi-steel or cast steel—float of seamless copper or stainless steel—and with the fine craftsmanship for which K & M has been recognized for 75 years. Our Engineering Department will be glad to make specific recommendations.

Write for General Catalog 66

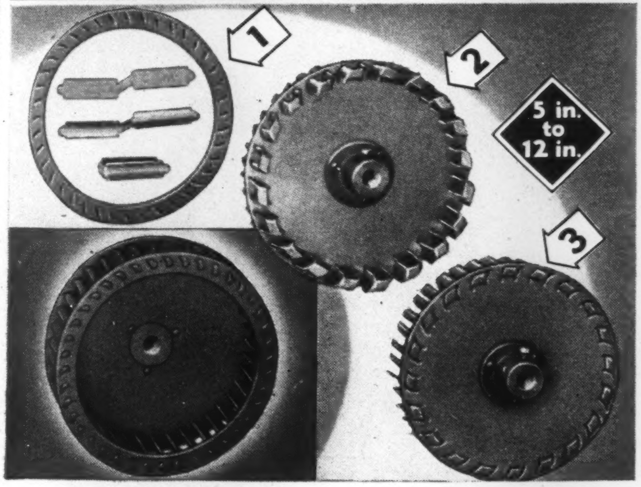
KIELEY & MUELLER, INC.
MANUFACTURERS OF PRESSURE AND LEVEL CONTROLS
NORTH BERGEN, NEW JERSEY

Awarded our employees for outstanding production achievement

OIL—Amendment 15 (issued last month) to the OPA's ration order No. 11 makes minor changes in methods of issuing certain rations and changes some of the thermal subzones in Table I and Table IC. Amendment 16 deletes the word "certified" and the phrase "for cancellation" in some sections of the order. Amendment 17 covers a new method by which the PAW and the OPA will administer certain phases of the oil rationing program. OPA will continue to have exclusive jurisdiction over the issuance of rations. In addition, OPA will process requests for reinstallations of heating equipment to use fuel oil in residences of less than four family capacity and applications for fuel oil for space heating in other structures using less than 10,000 gal of fuel oil per heating year. OPA will also have sole jurisdiction over the use of fuel oil burning space heaters. PAW will continue to make final determinations regarding installations of new oil burning equipment in any structure. PAW will process requests for authority to reconvert equipment to use fuel oil in buildings housing four families or more and in other buildings, where consumption of fuel oil is 10,000 gal or more per heating year. All applications for use of fuel oil in new and reinstalled oil burning facilities for agricultural, commercial and industrial processing will be handled by PAW. Appeals for the use of fuel oil in new and reinstalled oil burning facilities will be granted only if the applicant establishes that the use of a solid fuel would entail an exceptional and unreasonable hardship.

OIL—Minimum viscosities for various grades of civilian fuel oils to be manufactured, delivered, or re-

... Janette Blower Wheels



RUGGED and QUIET . . . *because of this patented construction*

1 The steel inlet and back plate discs and slots are die cut to ensure exact spacing of blades. The blades are formed in pairs to increase rigidity.

2 A machined heavy cast iron hub is riveted to the back plate, then the blades inserted into the slots.

3 The blades are spot welded to the back plate. The blade tips are then pressed thru slots in the inlet disc and bent against the inherent spring of the steel blades.

Why Not Use These Rugged Wheels in Your Apparatus?

Janette Manufacturing Company
556 W. Monroe St. Chicago 6, Ill.

PUMPED BY PEERLESS *daily*—

300

gallons of water

for every person in America

The combined daily productive capacity of the thousands of Peerless Deep Well Pumps is in excess of 36,000,000,000 gallons. This, figuratively speaking, is enough water to supply every person in America with 300 gallons per day. The colossal production of water, pumped by Peerless, is distributed among countless fields—for city water services, on farms and ranches for irrigation and live stock, and in factories and plants for critical war uses,—wherever a dependable water supply is needed. Engineers and experienced pump users made exhaustive study before selecting these thousands of Peerless Pumps. Their judgment is your protection.

PEERLESS PUMP DIV., *Food Machinery Corp.*
301 W. Ave. 26, Los Angeles 31, California
1250 Camden Ave., S.W. Canton 6, Ohio
OTHER FACTORIES: San Jose 5, Fresno 16, Calif.

PEERLESS

TURBINE **PUMPS** HYDRO-FOIL
HI-LIFT HYDRO-JET

ceived in Pacific coast states were announced June 28 by PAW (Petroleum distribution order 22, effective June 28).

POSTWAR PRODUCTION—The WPB issued July 23 rules under which manufacturers may be authorized to produce postwar experimental models if they do not divert manpower or facilities from war work to do so. These rules, contained in priorities regulation No. 23, grant blanket authorization to any person to engage in production of models, that orders from WPB heretofore prevented them from making, provided such activity does not cost more than $5000 a month in a single plant, including all direct costs such as materials, components, subassemblies, labor, designing, and drafting. Furthermore, authorization to make experimental models costing more than $5000 a month in a single plant may be obtained from the WPB by sending four copies of an application (form WPB-3879) to the field office nearest to the plant in which the work is to be done.

PRESSURE GAGES—Specifications for compound pressure gages which producers are authorized to manufacture and supply for Navy were listed July 21 by WPB. (Dir. 1 to sched. IV of LO-L-272.)

REFRIGERATION, AIR CONDITIONING EQUIPMENT—A proposed revision of limitation order L-38, covering industrial and commercial refrigerating and air conditioning machinery and equipment, was discussed at recent meetings of the general refrigeration and air conditioning and commercial refrigeration industry advisory committees, WPB announced July 22.

THEATERS—Although the construction of new movie theaters will continue to be severely limited, the

COPPER
SHEETS
STRIPS
ROLLS
TUBING
RODS
IN ALL STANDARD SIZES SHAPES AND FINISHES
Specify
HUSSEY
for
POST-WAR
PLANNING

HUSSEY COPPER

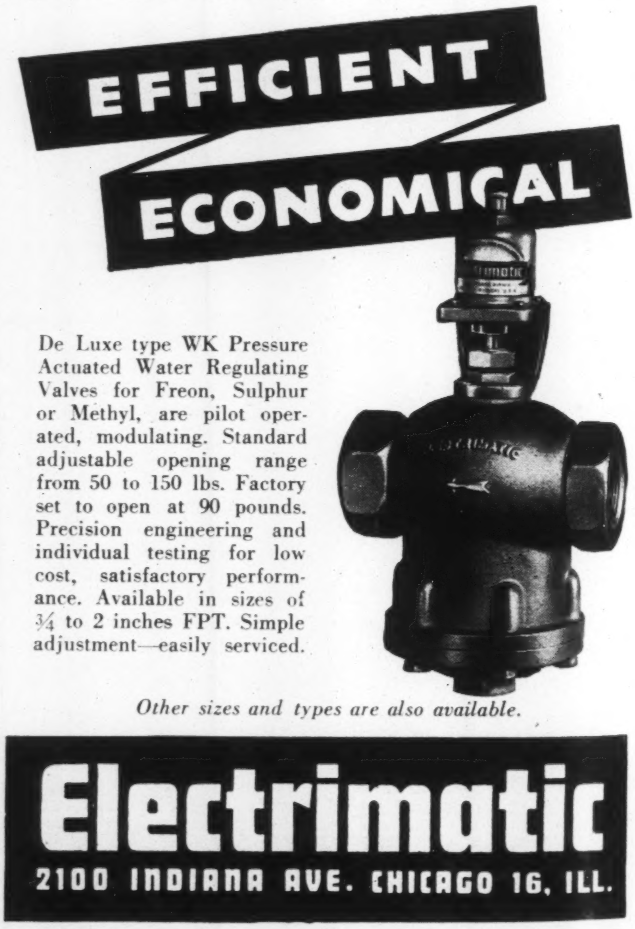
BACK FROM THE WAR . . . *Soon!*

WITH EVEN HIGHER STANDARDS OF UNIFORMITY —QUALITY—DEPENDABILITY

The many recognized properties that made Hussey Copper a "must" for War Service are advantages which will be indispensable to industry in peacetime activities.

Hussey research and engineering skill that have played an important part in the production of tremendous quantities of Copper so vital to winning the war, will be ready to help you in winning back your peacetime markets.

C. G. HUSSEY & COMPANY
(Division of Copper Range Co.)
Rolling Mills and General Offices: Pittsburgh, Pa.
Warehouses in principal cities



EFFICIENT
ECONOMICAL

De Luxe type WK Pressure Actuated Water Regulating Valves for Freon, Sulphur or Methyl, are pilot operated, modulating. Standard adjustable opening range from 50 to 150 lbs. Factory set to open at 90 pounds. Precision engineering and individual testing for low cost, satisfactory performance. Available in sizes of ¾ to 2 inches FPT. Simple adjustment—easily serviced.

Other sizes and types are also available.

Electrimatic
2100 INDIANA AVE. CHICAGO 16, ILL.

WPB said July 24 that every effort will be made to provide existing theaters with necessary operating equipment. This assurance was given to the newly-organized theater owners industry advisory committee by William Y. Elliott, vice-chairman for civilian requirements. Mr. Elliott advised the committee that the erection of new theaters will be permitted only when WPB is convinced that a new movie house is "absolutely essential" in the community. He urged that theaters expand their present services to the public wherever necessary by increasing hours of operation and by other methods.

WATER HEATERS—Limited production of electric water heaters for civilian use has been approved by the WPB at an annual rate not to exceed 37 per cent of total production by the industry during the base period (July 1, 1940, through June 30, 1941) it was reported July 4. Order L-185, water heaters, was amended to make the changes. Previously, electric water heaters were controlled by order L-65, electric appliances, which was administered by the consumers durable goods division, but this type of water heater has been placed under order L-185 of the plumbing and heating division so that production of all water heaters may be controlled by the same regulation.

Chemical Exposition and Conference

National Chemical Exposition, November 15-19, Chicago Coliseum, 15th and Wabash, sponsored by the Chicago section of the American Chemical Society. Marcus W. Hinson, 330 S. Wells St., Chicago 6, Ill., is the exposition manager.

0-1 .2 .3 .4 .5
HAYS

HOW DIRTY ARE YOUR FILTERS?

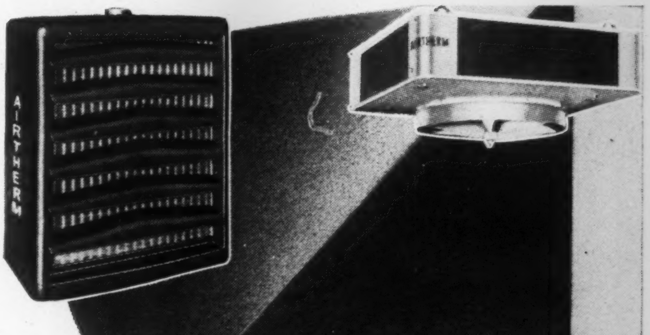
THIS GAGE TELLS

If you are confronted with the problem of not knowing when the collected dirt in your filters is of sufficient density to decrease operating efficiency, install a HAYS Air-Filter Gage. The HAYS indicator shows amount of air resistance at all times—tells when to renew filter element—eliminates guess work—can be made to sound alarm when resistance is excessive. Write for full information. Ask for HAYS Bulletin A-F G.

HAYS AIR-FILTER GAGE

- *Automatic*
- EASY TO INSTALL
- SAVES MONEY
- ELECTRICALLY OPERATED

The HAYS CORPORATION
SINCE 1903
COMBUSTION INSTRUMENTS AND CONTROL
MICHIGAN CITY, INDIANA, U.S.A



LOW-COST HEAT SPREADS EVENLY TO ALL CORNERS *with* AIRTHERM UNIT HEATERS

. . . an easy, economical way to warm every foot of floor space where steam is available. These unit heaters roll out broad streams of heated air that covers a large area and reaches even odd corners.

Airtherm insures maximum heat and usage at small cost. Both vertical and horizontal types have an extra-heavy tube-wall thickness of .065"; ingot iron tubes; and corrosion-resistant lead-alloy coated condensers.

Condensers guaranteed to withstand steam pressure up to 150 lbs. per square inch.

May we give you additional information?

AIRTHERM
MANUFACTURING COMPANY
711 S. SPRING AVE. ST. LOUIS 10, MO.

QUALITY always wins!

MARTOCELLO Products are fully DEPENDABLE

ATOMIZING SPRAY NOZZLES
SPRAY POND NOZZLES
(1900) ⅛" PS MALE
(1910) ¼" RS. MALE
⅜" PS. FEMALE
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(2300) ⅛" PS
(2304) ⅜" RS.
(2308) ¾" RS
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WATER DISTRIBUTORS

MARTOCELLO ATOMIZING SPRAY NOZZLES, SPRAY POND NOZZLES,
and
CONDENSER WATER DISTRIBUTORS
For Vertical Shell and Tube Ammonia Condensers

ALL MARTOCELLO SPRAY NOZZLES are manufactured with precision and of a design which has been thoroughly tested for maximum results and durability. They are guaranteed to give satisfaction. Successful, efficient results depend largely upon selecting the proper number, type and size of Nozzles suitable for your installation.

THE MARTOCELLO CONDENSER WATER DISTRIBUTORS are now used as standard equipment by Progressive Refrigerating Engineers in solving their Manpower problem, because they require no attention and assure users of the lowest Condenser Operating Pressures and Minimum Power Cost.

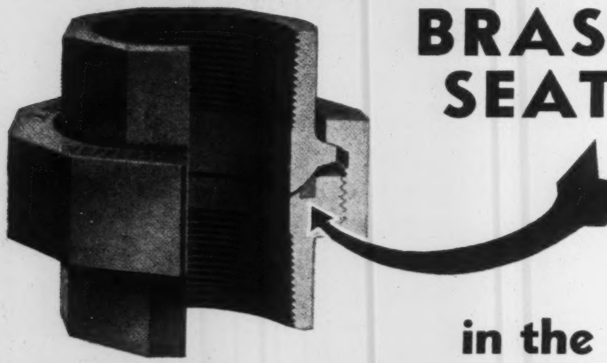
It will pay you to consult us on your next requirement of Atomizing Spray Nozzles, Spray Pond Nozzles and Condenser Water Distributors.

WRITE or WIRE for further information.

Jos. A. Martocello & Co. 229-231 NORTH 13th STREET PHILADELPHIA 7, PA.

"Serving the Ice Industry Since 1916" *"There is no Substitute for* MARTOCELLO QUALITY*"*

The RECESSED BRASS SEAT



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JEFFERSON UNION

is cut from seamless drawn tubing
—free from all casting defects—
sound and uniform always!

JEFFERSON UNION CO.
601 West 26th Street, New York 1, N. Y.
Factories at
Lexington 73, Mass. Lockport, N. Y.

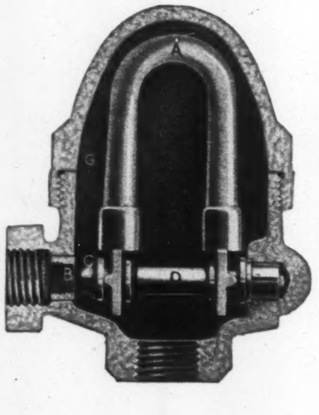
MEETINGS & CONVENTIONS

Power Engineers

National Association of Power Engineers, annual convention, August 22-25, Hotel Jefferson, St. Louis, Mo. F. C. Laufketter, Hotel Jefferson, St. Louis, is general chairman of the local convention committee. The 44th National Power Show will be held concurrently. The theme is "postwar power." An illustrated lecture on operating practice in firing pulverized fuel in large industrial plants is one of the educational features of the program.

Welding Society

American Welding Society, 25th annual meeting, October 16-19, Hotel Cleveland, Cleveland, Ohio., in conjunction with the National Metal Conference at the Hotel Statler in Cleveland. A session on piping and pressure vessels is scheduled for Wednesday afternoon, October 18, with papers on pressure vessel welding, by Edward B. McGuire, Hamler Boiler & Tank Co.; effect of normalizing on welded carbon-molybdenum pipe, by D. H. Corey, The Detroit Edison Co.; welding of dissimilar metals, by E. C. Chapman and R. E. Lorentz, Combustion Engineering Co.; and welding of vessels, by H. H. Needham, A. O. Smith Corp.



Fuel Saving

For economical and patriotic reasons for saving fuel we urge all users of Haines Traps to buy any required repair parts as early as possible.

If you prefer you can return the Traps to us for overhauling and testing.

Only a nominal charge will be made for labor plus the necessary worn parts replaced.

Merit Simplicity Durability

WILLIAM S. HAINES & CO.
460 N. TWELFTH ST.
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RECENT TRADE LITERATURE

For your convenience in obtaining copies of these bulletins, see coupon on page 155. If you write direct to the manufacturer, describe carefully what literature you want, as the number given first in each item is for use only when sending in your request to Heating, Piping & Air Conditioning.

Blower Wheels

No. 4756—20 p. bulletin (24-1) on blower wheels, illustrating and describing their features, and giving details, dimensions and performance data on wheels for food processing apparatus, oil burners, air cooled gas engines, gas burners, stokers, air conditioning equipment, dust collectors, superchargers, etc.—Janette Mfg. Co., 556 W. Monroe St., Chicago 6, Ill.

Boiler Ratio Meter

No. 4757—12 p. bulletin (4071) on a new boiler ratio meter, describing methods of checking combustion efficiency in boiler plants, discussing what constitutes an ideal boiler meter, and then describing the new boiler ratio meter, its features and principles, and giving installation details.—Cochrane Corp., 3131 N. 17th St., Philadelphia 32, Pa.

Controls for Process and Production Equipment

No. 4758—8 p. bulletin (T-46) on electrically operated industrial controls for process and production equipment for automatic regulation of time cycle, tempera-

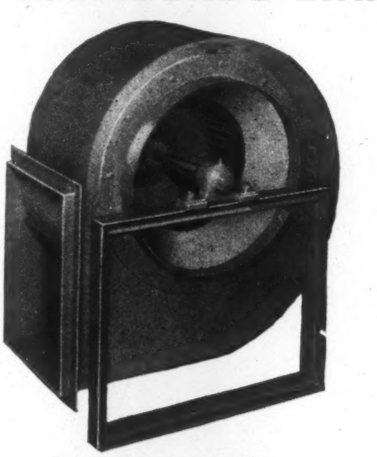
"GENERAL" MULTIBLADE EXHAUSTERS

A Full Line

Forward and Backward Curved Blades

All Drive Arrangements

Surprisingly Quick Deliveries



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GENERAL BLOWER CO.

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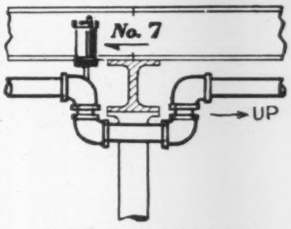
GET THAT AIR OUT OF THERE

And Keep It Out With

AUTO-VENT AIR ELIMINATORS



Venting Trapped Mains and Circulating Lines.

Circulation Troubles?

Don't fight air pockets or traps in hot or cold circulating lines? "Get that air out of there" *and keep it out* simply by installing the No. 7 Maid-O'-Mist Automatic Air Vent. This reliable air vent has a self-closing float-controlled valve and is designed especially for circulating pipe lines, concealed radiators, unit heaters, cooling manifolds, tanks, diesel engines, or any other application where air pockets or traps retard the free circulation of liquids. Now available in bright brass finish.

APPROVED FOR NAVY, MARITIME COMMISSION AND ARMY USE

MAID-O'-MIST INC.

AUTOMATIC HUMIDIFIERS FOR ALL TYPES OF HEATING SYSTEMS

211 NORTH ABERDEEN STREET
CHICAGO 7, ILLINOIS

STOP THAT DRIP

No More Damage from Condensation or Sweating Pipes, Tanks, Walls, Ceilings and Air Ducts

NoDrip A SURE CURE

• This sensational plastic cork coating prevents condensation drip from metal, concrete, brick, wood, plaster or composition surfaces. Permanently protects metal against rust and corrosion, thus prolonging life of pipes, tanks, etc. Forms a moisture-proof, insulation type coating impervious to acid and alkali.

Stucco-like finish requires no maintenance. A gallon covers about 30 feet of ½" pipe. Dries in 24 hours. Comes in 1, 5 and 55 gallon drums.

Immediate Shipment. Order from your Supply House.

FREE *NoDrip Circular about Condensation Drip and its Prevention.*

J. W. MORTELL CO.

Technical Coatings Since 1895

512 BURCH ST. KANKAKEE, ILL.

APPLY WITH BRUSH, TROWEL OR SPRAY

We Are Doing Our BEST for UNCLE SAM

We'll Do the Same for YOU

Our business is building pumps. Our ONLY policy is to build fine pumps. When you install pumps "by Aurora," you know that lasting efficiency and dependability are at work on your important liquids handling jobs.

Aurora Deep Well Turbines for all conditions—4" to 24"

Type AD Hor. Split Case, Two Stage Centrifugal

NSA Aurora Centrifugal Sump Pump

Type OD Hor. Split-Case Double Suction Single Stage Centrifugal

APCO TURBINE-TYPE PUMPS—the simplest of all pumps. Ideal for small capacity, high head duties. Silent, compact and lasting.

APCO Horizontal Condensation Return Unit

Type GMC Close-Coupled Centrifugal

Write for **CONDENSED CATALOG OR**

Type GGU Side Suction Single Stage Centrifugal

APCO Single Stage Turbine-Type

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AURORA *Always* PUMPS

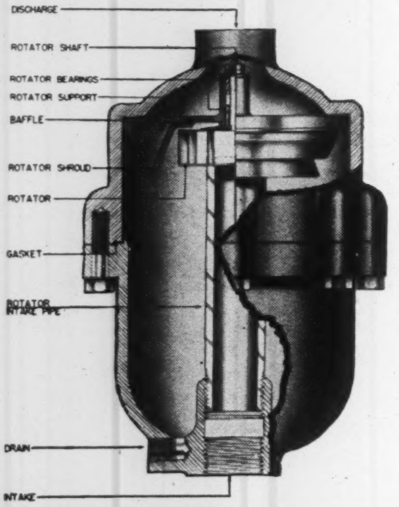
AURORA PUMP COMPANY

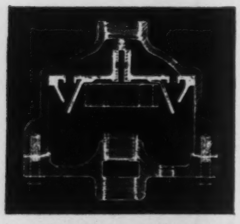
80 Loucks Street, AURORA, ILLINOIS

NEW TURBO-ROTOR *Pur-O-fier*

For Compressed Air

This new unit effectively eliminates moisture, oil and scale from compressed air lines. Pur-O-fier utilizes the principle of centrifugal force to separate entrainments from purified air. Once installed it requires absolutely no maintenance. Penstar Tru-Bond oiless bearing guarantees long, trouble-free operation. Manual or automatic drains provided.





Drawing shows turbo-rotor, shroud and baffles. The design of the baffles precludes the possibility of capillary action of entrainments resulting from high velocity.

THREE MODELS AVAILABLE—A-1 will accommodate volumes from ½ to 5 cu. ft. A-2, volumes from 10 to 35 cu. ft. A-4, volumes from 35 to 100 cu. ft. Multiple units are recommended for volumes above this range. Pur-O-fier is the only standard unit that can be engineered to meet any air volume for regular or intermittent service.

BIRD-WHITE COMPANY
3120 West Lake Street, Chicago, Illinois
Dept. H.P.

ture, flow, and mechanical movement. Features of the various controls are discussed and selection data are given.—Automatic Temperature Control Co., Inc., 14 E. Logan St., Philadelphia 44, Pa.

Gaskets

No. 4759—20 p. catalog (202) on metal asbestos, spiral wound gaskets for pressures from 10 to 3500 psi, including specifications, prices, etc. This line includes gaskets of "all types for power, municipal, chemical, and industrial installations."—United States Gasket Co., 1518 Pierce Ave., Camden, N. J.

Grating and Stair Treads

No. 4760—24 p. bulletin of data on open steel grating and stair treads with construction particulars, drawings, and tabular specifications, as well as numerous photographs of the product in actual plant and building uses, among which are boiler and engine rooms, foot walks for valve operation, etc.—Wm. F. Klemp Co., 6601 S. Melvina Ave., Chicago 38, Ill.

Hydraulic Gages

No. 4761—4 p. bulletin (230-A) describing and illustrating several types of hydraulic gages and giving specifications and construction details.—Watson-Stillman Co., 140 Aldene Rd., Roselle, N. J.

Insulation

No. 4762—Issue of the Insulator (Vol. 14, No. 1) including an article describing how "Foamglas" insulation is made, and giving physical and thermal properties of this cellular glass, low temperature, insulation material. —Armstrong Cork Co., 4400 Concord St., Lancaster, Pa.

Lubrication Systems

No. 4763—16 p. bulletin (25) on centralized systems of lubrication, discussing theory and practice, and analyzing the machinery lubrication problem.—Farval Corp., 3295 E. 80th St., Cleveland 4, Ohio.

Pop Safety Valves

No. 4764—8 p. bulletin (501-A) on pop safety valves, presenting an interpretation of the new safety valve standards developed under War Production Board and Bureau of Standards auspices. Sizes, connections, service limits, and other specifications are tabulated and summarized for each type of valve and the manufacturer's designs corresponding to the official standards are described and illustrated. Miniature "blueprints" of each design are included.—J. E. Lonergan Co., Second and Race Sts., Philadelphia 6, Pa.

Refrigeration and Air Conditioning Accessories

No. 4765—Condensed catalog (88-L) describing the manufacturer's line of refrigeration and air conditioning valves, fittings, service tools, and allied items, including such recently introduced items as the double flaring tool for thin wall tubing, a flaring tool for plastic tubing, a self-clamping flaring tool, and other equipment.—Imperial Brass Mfg. Co., 1200 W. Harrison St., Chicago 7, Ill.

Regulators for Welding and Cutting

No. 4766—16 p. bulletin (40) describing design and construction features of single and two stage reduction regulators employed in the welding industry.—Victor Equipment Co., 844 Folsom St., San Francisco 7, Calif.

Spot Welders

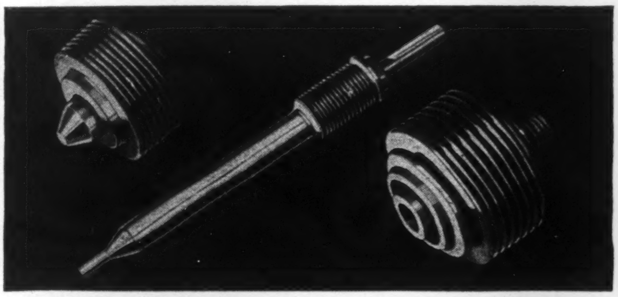
No. 4767—58 p. catalog (CE-44W) on spot welders, showing many types of standard and special resistance welding machines in a capacity range from 3 kva up to 500 kva. Application data, installation views, and specifications are included.—Eisler Engineering Corp., 754 S. 13th St., Newark 3, N. J.

Thermal Switches

No. 4768—44 p. catalog on "Thermoswitches" for temperature regulation, describing the features and applications of the units in industrial and commercial work for a range from subzero to 1200 F. Various types of switches have been designed for the control of temperatures of solids, gases, and liquids, and new adaptations have been added for aircraft and railway use. An extensive section of the booklet includes data on selection of these switches and actual temperature charts and diagrams to illustrate basic principles.—Fenwal, Inc., 200 Pleasant St., Ashland, Mass.

V Belt Drives

No. 4769—Quick picture bulletin (B6331) describing each of the various v belts, sheaves, and drives of the manufacturer, including five special kinds of "Texrope" v belts, each for a specific type of protection, the new "Magic Grip" sheave, the four speed changing methods used in the manufacturer's sheave, and other products. —Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.



HOW TO GET LONGER LIFE FROM THERMOSTATIC ASSEMBLIES

CHOOSE: *Hydraulically-Formed Bellows . . . Assembled by Clifford*

Steam traps, tank temperature regulators, pressure regulating valves, hot water temperature relief valves, mixing valve thermostats, room thermostats, and secondary heating thermostats which automatically compensate for out-door temperatures—all perform longer and more efficiently when built around Hydron, *industry's first hydraulically-formed bellows.* You can prove it by getting the facts on Clifford's complete engineering and assembly service from a Clifford engineer. Write today to Clifford Manufacturing Co., 562 E. First Street, Boston 27, Mass.

CLIFFORD

First with the Facts on Hydraulically-formed Bellows

HYDRON

USE LESS COAL

Get More Heat!

THE high efficiency of the FREDERICK STOKER brings benefits to the user in two ways. He saves coal and he gets more heat with the smaller tonnage of fuel.

This is not a miracle . . .

but the result of matter-of-fact application of engineering principles of design to obtain maximum combustion efficiency at the least possible combustion rate per square foot of grate area; completely enclosed wind-boxes; continuous speed type transmission; underfeed firing and other refinements of design.

If you are not getting full heat value from the tonnage of coal you use, look into the money-saving merits of the

FREDERICK STOKER

Just write:

THE *Frederick* IRON & STEEL CO.
Frederick, Maryland

HOW TO MELT SOFT METALS

ELECTRICALLY -

To melt tin, lead, babbitt, solder, type metal, use the

CHROMALOX
ELECTRIC
MELTING POT

Clean, safe, convenient—May be connected anywhere on the power line—

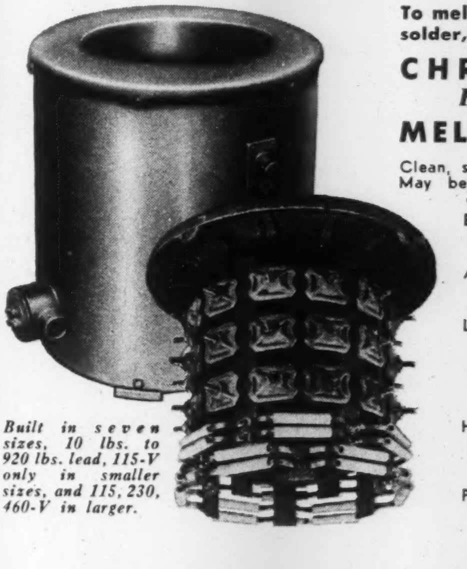
Eliminates uncomfortably hot working conditions—

Avoids excess dross, because it cannot overheat—

Large sizes have thermostatic control for use up to 900° F. Smaller sizes manual 3-heat switch for use up to 750° F.

Heated by dependable, enduring Chromalox electric heating units—

Pot is complete with insulating jacket and flexible conduit or terminal box.



Built in seven sizes, 10 lbs. to 920 lbs. lead, 115-V only in smaller sizes, and 115, 230, 460-V in larger.

Chromalox electric heating units are made in types for all industrial heating needs. Write for the Chromalox 64-page Catalog. If you have a specific heating problem, use our expert aid. No obligation.

EDWIN L. WIEGAND COMPANY
7610 Thomas Blvd. Pittsburgh 8, Pa.

UNCLE SAM PICKS YOUR PROSPECTS FOR
today's Stoker Sales

There's a big opportunity for Gehl Stoker dealers RIGHT NOW. Your Government encourages stoker installations in office buildings, hospitals, schools, churches, hotels. Most users of 25 or more tons of coal per season, are eligible to buy. They can save money, coal, time, and help the war effort by installing . . .

GEHL STOKERS

Dealers who line up now will be ready for the big postwar demand in domestic, commercial and industrial stokers. Write today for literature and dealer plan.

The performance records of Gehl Stokers over a period of years is outstanding. Gehl engineering backed by 76 years' experience has pioneered many noteworthy features, such as rust-resisting, all-cast chassis; Air Governor, fuel-saving automatic control of chimney draft, and other advantages that make sales and satisfied users.

MEMBER I.C.I.

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Established 1867. Dept. BH-842, West Bend, Wisconsin

A GEHL WINS FRIENDS WHEREVER IT GOES

AIR CONDITIONING NOZZLES

YARWAY
YARWAY INVOLUTE

Nozzles of unique Yarway Involute Design.

No internal parts or vanes to clog or erode.

Insure trouble-free air washing service.

Sizes and types for all requirements.

Many large users—installations total more than 5 million gallons per minute in water cooling and air conditioning service. Write for Bulletin N-616

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YARWAY

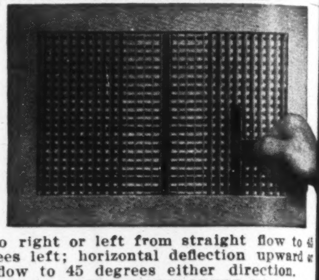
Welding Fluid

No. 4770—6 p. bulletin on "No-Spat" welding fluid describing tests made to determine the effects of using an anti-spatter fluid in welding, and including laboratory reports on tests for determining weld strength and weld soundness.—Midland Paint & Varnish Co., 911 Reno Ave., Cleveland 5, Ohio.

Worm Gear Reduction Units

No. 4771—16 p. bulletin (300) on "Speedaire" fa cooled type, worm gear, reduction units, describing th principle of operation and with charts, diagrams, an engineering tables. Detailed instructions for planning installations of these units are included.—Cleveland Worm and Gear Co., 3301 E. 80th St., Cleveland 4, Ohi

DOUBLE ADJUSTABLE GRILLES



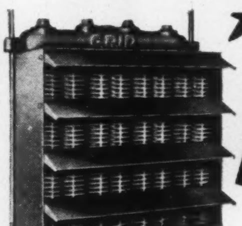
Design 5050VA—Made in all Standard Sizes; special sizes made to order. Vertical bars on face are adjustable in groups; horizontal bars on back are similarly adjustable. Back louvres can be adjusted from face. Allows vertical deflection of air to right or left from straight flow to 45 degrees right and 45 degrees left; horizontal deflection upward or downward from straight flow to 45 degrees either direction.

STANDFORATED

FOR PRODUCTION SPEED-UP—
Specify Precision Processed STANFORATED Perforations. Industrial Screens, Filters, Guards, etc., made to specifications for vital industries. Handy catalog sent on request.

STANDARD STAMPING & PERFORATING CO
3151 W. 49th PLACE · CHICAGO, ILLINOIS

Here is Trouble Fre Heating Servic



GRID UNIT HEATER

Reports a large chemical plant after 8 years of operating GRID Unit Heaters in very corrosive atmospheres. "We certainly recommend them for installation where corrosive fumes or other severe conditions exist, for the construction of the heating element and materials are ideal for such service." (Name of plant upon request.)

IT HAS THE RIGHT MATERIALS FOR SERVICE UNDER SEVERE CONDITIONS

★ One piece construction heating sections (patented) of high test cast iron.
★ No soldered, brazed, welded or expanded connections.
★ Similar metals so there is no electrolysis to cause corrosion, breakdowns or heating failures.

That's why GRID Unit Heaters outlast other types of heating equipment, without maintenance expense. They are built to last—to stand wear as long as the pipes furnishing steam or hot water to them, so why install unit heaters that will lose their efficiency after a short period when you can get GRID for permanency? Complete data and capacity tables upon request.

GRID

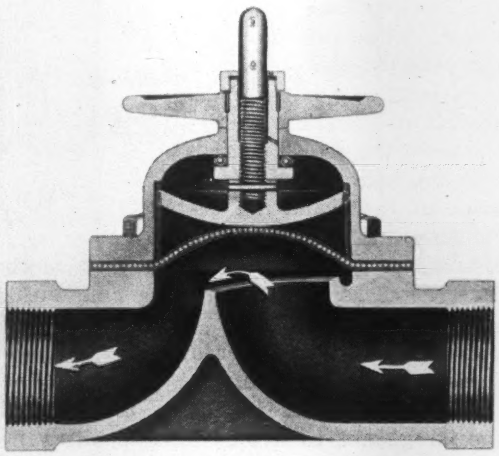
D. J. MURRAY MANUFACTURING CO. WAUSA WISCO

• EQUIPMENT DEVELOPMENTS •

For your convenience in obtaining more information about any of this equipment, see coupon on this page. Add the new products and companies listed here to your Directory Section which you received in your January 1944 Heating, Piping & Air Conditioning and thus keep your records of sources of supply up to date throughout the year. Single asterisk indicates equipment not listed in Directory Section; double asterisk equipment and manufacturer not listed.

Diaphragm Valve

No. 2678—A new diaphragm valve designed for service on "hard to handle" fluids requires no repacking, no reseating, has no stuffing box, and all moving parts are fully protected from the fluids handled, according to the manufacturer. With recommended linings, it is said to be practically indestructible in service with acids, alkalies, abrasives, foodstuffs, etc. The valve may be installed in whatever position gives greatest accessibility, either above or below ground, and is said to be leakproof in any position. It is also stated that solids trapped on the seat cannot hold the valve open, the tight shutoff being obtained by the pressing of the diaphragm against the continuous seat around the inlet side of the weir.



Special types of this valve may be operated from remote points either by air or water pressure, or by hand or automatic time clock, or with a pilot valve.

This valve normally has a semisteel body and bonnet with a stainless steel stem and is available in 10 sizes from ½ to 6 in., with screwed or flanged ends. The diaphragm is of molded synthetic composition. When the valve is used on vacuum service, a small button head screw is inserted through the diaphragm to insure positive opening of the valve. In general, the valve is suitable for pressures up to 150 psi and temperatures up to 150 F.—McAlear Mfg. Co., 1901 S. Western Ave., Chicago 8, Ill.

Bulkhead Seal for Piping

No. 2679—Installation of a new type of bulkhead seal on the Army's sturdy FP boats is enabling piping which passes through bulkheads and that used for deck penetrations to be fitted in one-fourth the time formerly required. There are some 12 deck penetrations and 50 bulkhead penetrations on an FP boat. To fit and weld together a make-up of pipe and fittings to accommodate pipe passages through bulkhead and deck penetrations was a long, tedious and exacting job under old methods of construction.

The bulkhead seal is essentially a stuffing box gland. It consists of a few accurate, carefully engineered parts, easily and speedily installed, using only regular equipment and an ordinary wrench. Metal parts are of steel. Gaskets are of rubber compound.

The flexible gasket pipe-grip embodied in the bulkhead seal permits free and independent movement of the pipe, to expand, contract and deflect in passing through a ship's bulkhead. This avoids the possibility of harmful stresses.

Trial runs have demonstrated that vibration noises are effectively dampened. The pipe is surrounded in the middle ring or sleeve of the bulkhead seal by resilient wedge-section gaskets. Metal to metal contact and the transmission of vibration are thus greatly minimized.

The bulkhead seals are used on all types of lines through which fluids are to pass. Their main advantage, according to naval architects engaged in the shipbuilding program, is their flexibility. The seals are used on bilge and ballast lines for salt water, on deck penetrations for hot and cold fresh water piping. They are also suitable for use with oil or other fluids, and for use on steam up to 100 psi.—Dresser Mfg. Co., 490 Fisher Ave., Bradford, Pa.

Combustion Control System

No. 2680—A new thermostatically regulated combustion control system for hand fired heating plants "is designed to save fuel and increase efficiency and conveni-

Heating, Piping & Air Conditioning, [9-44]
6 N. Michigan Ave., Chicago 2, Ill.

Please ask the manufacturers to send me more information about the equipment mentioned under the following reference numbers in Equipment Developments and Recent Trade Literature.

(Circle each number in which you are interested)

2678 2679 2680 2681 2682 2683 2684 2685 2686 2687
2688 2689 2690 2691 2692 2693 2694 2695 2696 4772
4773 4774 4775 4776 4777 4778 4779 4780 4781 4782
4783 4784 4785 4786 4787 4788 4789 4790 4791 4792
4793

Name ....Title............

Company ....

Address ....

City ....State............

AIRTHERM UNIT HEATERS

Now Available with Copper Coils

Available on AA5, or Better, Priority

Horizontal Unit Heaters

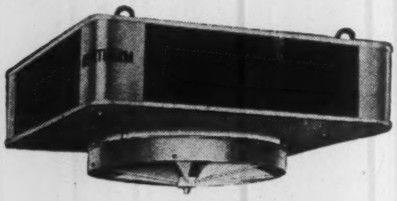
(Copper)

CAPACITIES

Model	Btu/hr.	Motor HP	Motor RPM	CFM	Final Temp. °F.
M-25C	25,400	1/45	1580	410	114
M-35C	35,000	1/33	1580	585	114
M-45C	45,000	1/33	1580	685	118
M-60C	60,000	1/20	1140	1020	114
M-87C	87,000	1/8	1140	1500	113
M-114C	114,000	1/8	1140	1905	114
M-140C	140,000	1/6	1140	2400	113
M-170C	170,000	1/6	1140	2650	118
M-215C	215,000	1/4	1140	3600	114
M-278C	278,000	1/2	1140	4300	118

Btu/hr. computed at 2 lb. gage steam pressure and 60°F. entering air.

Vertical Delivery Unit Heaters



CAPACITIES

Model	Btu/hr.	Motor HP	Motor RPM	CFM	Final Temp. °F.
V-145C	145,000	⅛	1140	2700	114
V-175C	175,000	⅓	1725	3400	111
V-191C	191,000	¼	1140	3300	118
V-234C	234,000	½	1725	4300	114
V-260C	260,000	½	1140	4550	115
V-340C	340,000	½	1140	5600	120
V-480C	480,000	1	1140	8000	120
V-600C	600,000	1½	1140	11000	115

Send today for bulletin giving complete information and prices.

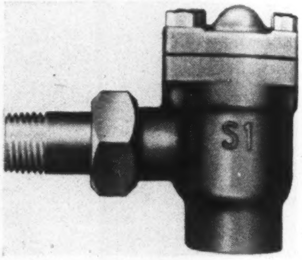
AIRTHERM

MANUFACTURING COMPANY

711 South Spring Avenue • Saint Louis 10, Missouri

ence." It incorporates a barometric draft control with an attached damper operator, a dial thermostat, and a limit control. The light weight square vane of the draft control is mounted in a square channel, which—according to the manufacturer—allows 20 per cent greater air intake and assures positive checking action. The operator, which is linked to the draft door and vane control, functions through hydraulic action, and has a safety cutoff feature in case of power failure.—Perfex Corp., 500 W. Oklahoma Ave., Milwaukee 7, Wis.

Trap Incorporates Postwar Features



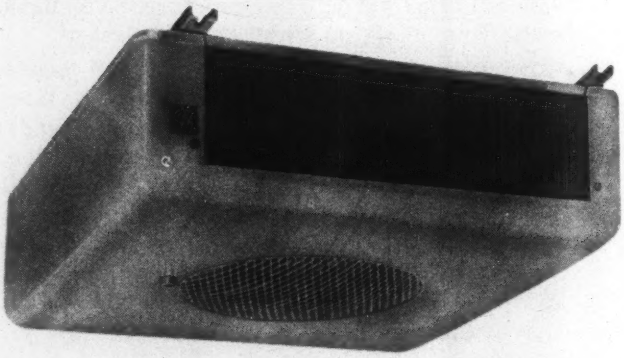
No. 2681—The model "S-1" trap has been built to incorporate prewar and postwar mechanical construction features into a trap body which complies with WPB material requirements. The same multiple corrugated bellows for sensitivity—quick discharge of air and steam—are used, the maker states.

Seats and plungers are made of brass and are removable, and tail pipes and collars are brass. The entire trap mechanism is so constructed as to be interchangeable with the all brass traps now designed for postwar installations. Standard capacity ratings for all brass traps now apply to these iron body traps.

The trap is assembled by means of bolts and a special gasket to avoid the difficulties incurred from tops rusting tight to bodies.—The Trane Co., La Crosse, Wis.

Air Coolers for Cold Rooms

No. 2682—To meet the demand for cleanliness and attractive appearance in ceiling type horizontal coolers for cold rooms and large refrigerators, a new series of "Spasaver" air coolers, housed in streamlined white enamel cabinets, suitable for all refrigerants and ready for installation, has been announced.



Models in 10 different sizes are available, designed for use in institutions, restaurants, food processing plants, and similar fields where cleanliness and sanitation are important.

Equipped with new type propeller fans, the units operate with practically no noise, says the manufacturer. Coils are of the fin and tube type, equipped

AIRCO GASES

. . . FOR PRODUCTION, MAINTENANCE AND RESEARCH

AIRCO gases, produced by modern scientific methods to the strictest standards of purity and uniformity, are supplied to industry through nationwide Airco distributing points. These gases are available in volumes to meet every requirement . . . in standard commercial size cylinders and in trailers with capacities up to 40,000 cu. ft. Thus Airco gases are quickly delivered to shops and plants throughout the country in whatever size containers are most suitable for the customers' needs. In that way, individual requirements for 200, 20,000, or several million cubic feet, monthly, are met.

To assist manufacturers in using these Airco gases most effectively, Air Reduction provides "on-the-job" technical assistance through its Applied Engineering Field Service Department. For further information on Airco gases—as well as Airco's complete line of apparatus and supplies for every oxyacetylene flame application and arc welding need—call or write the nearest Airco office, or, if you prefer, communicate direct with the New York Office, Department H.P.A.C.

OXYGEN guaranteed 99.5% pure . . . assures maximum speed and economy in cutting, and greater efficiency in welding.

ACETYLENE proved by use and test to be the most economical fuel gas for oxyacetylene welding and other flame applications.

NITROGEN dry and inert, contains less than 0.3% oxygen. Also available at higher purity to meet specialized needs.

HYDROGEN produced electrolytically, contains less than 0.5% oxygen.

ARGON manufactured pure or mixed with nitrogen as specified by user.

HELIUM is available with a purity of approximately 98% and higher.

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FOR

Curing the Ills

IN REFRIGERATION
AND AIR CONDITIONING
SYSTEMS

● When a system is sluggish we recommend an ACME heat exchanger and oil separator as a cure for this ailment.

When compressor capacity is on the border line for load requirements—these additions to the system will be found highly effective.

Many hundreds of installations in actual operation substantiate this suggestion.

For complete information—write for Catalog No. 12.

ACME INDUSTRIES
JACKSON, MICHIGAN

OIL SEPARATOR

The chief purpose of an oil separator is to remove oil from the discharge gas and return it to the crankcase. An oil separator should return the oil to the compressor crankcase before it reaches the evaporator side of the system. Acme Oil Separators are designed for installation between the compressor and the condenser.
Write for Catalog No. 15.

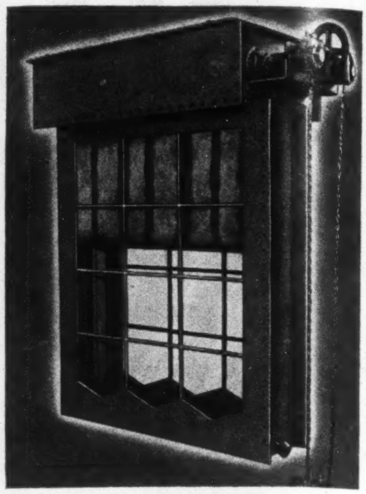
ACME
PRODUCTS

ACME PRODUCTS
Evaporative Condensers, Ammonia Condensers, Freon Condensers, Dry-Ex Water Coolers, Flooded Water Coolers, Hi-Peak Water Coolers, Pipe Coils, Heat Interchangers, Oil Separators, Liquid Receivers, Forced Convection Units, Heat Exchangers. *Write for Catalog on any item*

with the "D & H kinetic type" refrigerant distributor. Motors are slow speed, totally enclosed, ball bearing—115 volt, single phase, 60 cycle—requiring no lubrication after leaving factory.—Drayer-Hanson, Inc., 738 E. Pico St., Los Angeles 21, Calif.

Reverse Flow Damper

No. 2683**—The new "Heacon" damper, recently introduced, employs two curtains for regulating gas flow in either direction. The curtains are tied together mechanically so as to operate simultaneously. This permits flow in either direction regardless of the damper position, says the maker.

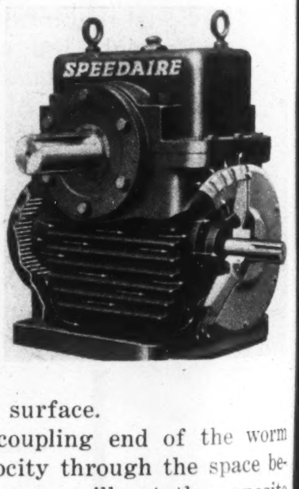


With a damper of this type in a natural draft by-pass around fans, or in heat or dust regulator equipment, complete isolation of the equipment for maintenance purposes is provided. Elimination of recirculation gives increased capacity and heat absorption, thereby reducing the maintenance of equipment under control. Banking losses are reduced and accurate regulation of natural draft is obtained, it is announced.

This damper can also be used in crossover air ducts between forced draft fans.—Thermix Engineering Co., Greenwich, Conn.

Cooling System for Gear Reduction Unit

No. 2684**—The "Speedaire" worm gear reduction unit incorporates a fan cooling system which permits a pronounced reduction in size of the unit required for a given hp output, says the manufacturer. The basis of the cooling system is a new type of double wall construction which provides an air passage completely enveloping the oil reservoir in which the gear operates. The inner housing wall forming the oil reservoir is deeply finned on the air side, resulting in a marked increase in heat dissipating surface.



An exhaust fan on the coupling end of the worm shaft draws air at high velocity through the space between the housing walls from a grille at the opposite end of the unit. This fan is designed to operate with either direction of rotation. The effect of the double wall construction is to maintain a uniform flow of cooling air against the fins and housing wall over the whole oil reservoir surface, and thus to utilize the full

Better Homes & Gardens
THE SATURDAY EVENING POST
FURLOUGH IN
Yankees on
GLAMOUR PATTERN FOR HOPELESS BASEMENTS
The American Home
15¢
GARDEN SURPLUS
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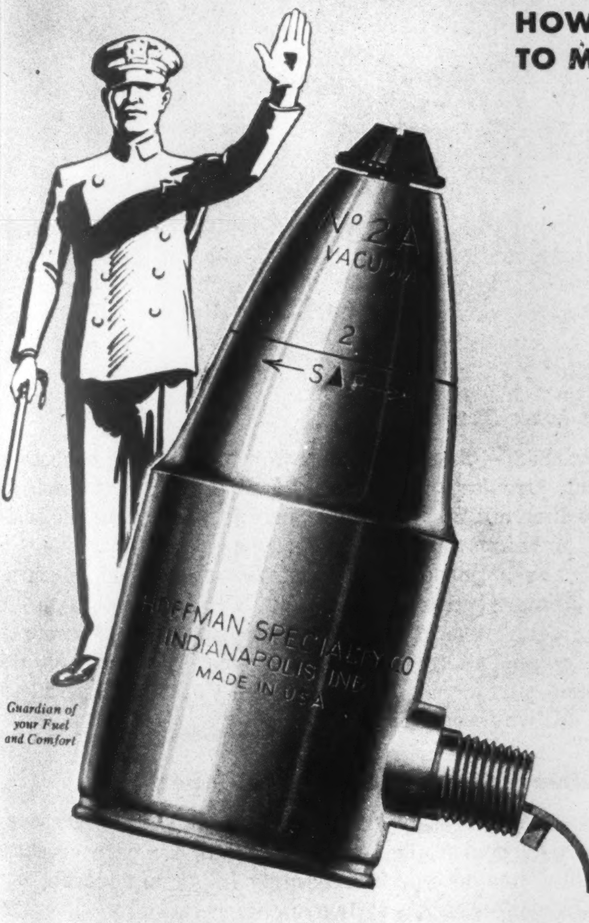
BACKING FUEL CONSERVATION

HOW TO SAVE FUEL WITH VACUUM VALVES TOLD TO MILLIONS IN HOFFMAN NATIONAL ADVERTISING



Guardian of your Fuel and Comfort

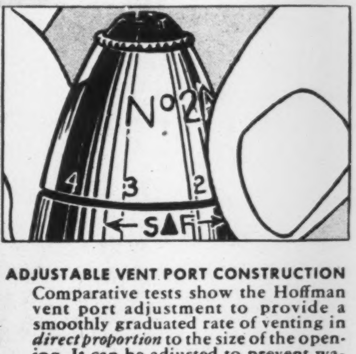
If there ever was a time you could sell vacuum valves for one-pipe systems, *it's now!* Fuel rationing has made it imperative that building owners use every means to cut fuel consumption. Hoffman advertising in nationally circulated magazines shows them *how to do it!*

In selecting a radiator valve to meet today's firing conditions, the main consideration is to obtain an adjustment of venting rates which will enable all radiators in the system to vent equally and at the same time. Hoffman Venting Valves accomplish this purpose admirably . . . *because they are equipped with a scientifically designed venting adjustment.* See illustration below.

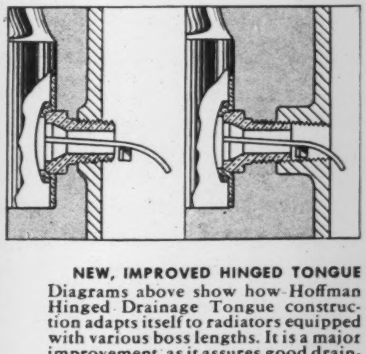
Hoffman's line of radiator and main vent valves meets all the venting requirements of both gravity and vacuum steam systems and are available in low, medium and higher priced grades.

FOR THE HEATING CONTRACTOR'S BENEFIT

This year, as always, Hoffman is promoting the interests of the heating contractor by consistently advertising its products to the public. And, as always, the Hoffman sales policy is to distribute Hoffman Specialties only through the channels of Wholesaler to Trade to Consumer.



ADJUSTABLE VENT PORT CONSTRUCTION
Comparative tests show the Hoffman vent port adjustment to provide a smoothly graduated rate of venting in *direct proportion* to the size of the opening. It can be adjusted to prevent water-logging, spitting and rumbling caused by *too fast* venting.



NEW, IMPROVED HINGED TONGUE
Diagrams above show how Hoffman Hinged Drainage Tongue construction adapts itself to radiators equipped with various boss lengths. It is a major improvement, as it assures good drainage under all conditions of service. An exclusive Hoffman feature.

HOFFMAN VENT VALVES

HOFFMAN SPECIALTY CO., 1001 YORK ST., DEPT. FG-9,
INDIANAPOLIS 7, IND. MAKERS OF VALVES, TRAPS,
HOT WATER HEATING SYSTEMS, VACUUM AND
CONDENSATION PUMPS . . . SOLD BY LEADING WHOLESALERS OF HEATING AND PLUMBING EQUIPMENT.

Controlled Heating

STEAM HOT WATER

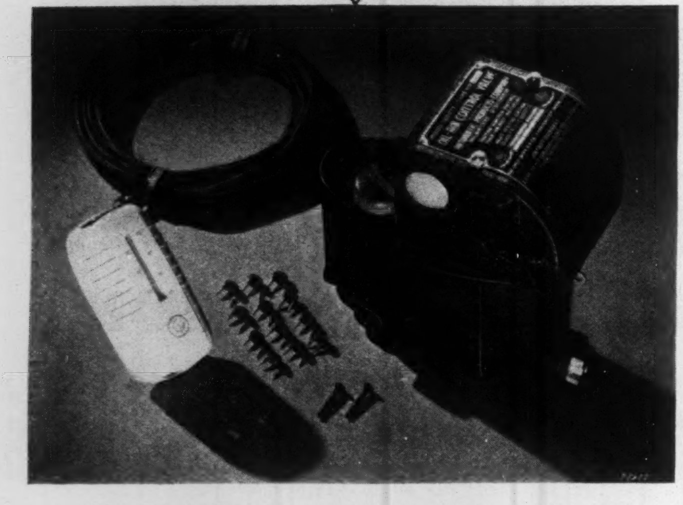
★ ★ ★ ★ ★ ★ ★ ★ ★

FUEL CONSERVATION...

Today—A Wartime Necessity

Tomorrow—A Profitable

SALES ADVANTAGE



A-P Complete Furnace Control Set for gravity-fed Oil Burning Furnaces. Precision-built, includes sensitive thermostat, constant level oil control, fan switch and inbuilt transformer.

Saving fuel oil — helping get more heat on less oil — is one of the reasons for A-P DEPENDABLE Oil Control Valves on today's Heaters and furnaces. And lucky the owner of one of these A-P equipped heating units today, for if he does not already have THERMOSTATIC Temperature control, it can be easily added — for EXTRA fuel savings — in preparation for reduced fuel rations.

When planned new "marvels" of heating convenience go to market, *fuel economy* will be one of their great sales features. It's a promise already a reality in A-P research laboratories, where new A-P DEPENDABLE Oil Control Valves are already on test for tomorrow's heaters and furnaces. Far advanced in control knowledge, A-P designers and engineers are today lending their talents to manufacturers planning new peacetime products. Watch for the benefits of their efforts. USE them on your new fuel control problems.

Fuel-Saving Starts With
CONTROL

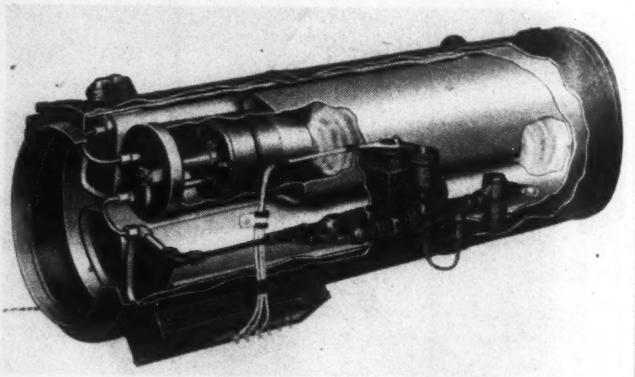
AUTOMATIC PRODUCTS COMPANY
2460 NORTH 32nd STREET
MILWAUKEE 10, WISCONSIN

AP DEPENDABLE
OIL CONTROLS

heat transfer efficiency of the system.—Cleveland Worm and Gear Co., 3301 E. 80th St., Cleveland 4, Ohio.

Aircraft Heaters

No. 2685**—The series "SRH" aircraft heater illustrated embody a new combustion process known as vapor entraining, which uses a capillary vaporizing block in conjunction with preheated combustion air. To avoid lead oxide formations and prolong life of burner parts the flame is completely suspended. An unusually low pressure drop permits efficient operation at low ram pressures, says the manufacturer. The flame is said to be so stable that its characteristics are the same regardless of the plane's altitude or speed, and barometric compensation permits operation up to 40,000 ft.



Another feature is the use of multiple heat exchanger compartments giving the flame and hot gases a travel of four times the length of the exchanger. Capacities available are 100,000 and 50,000 Btu per hr. Blowers can be supplied for ground operation.—Fluid Heat Div., Anchor Post Fence Co., Baltimore 24, Md.

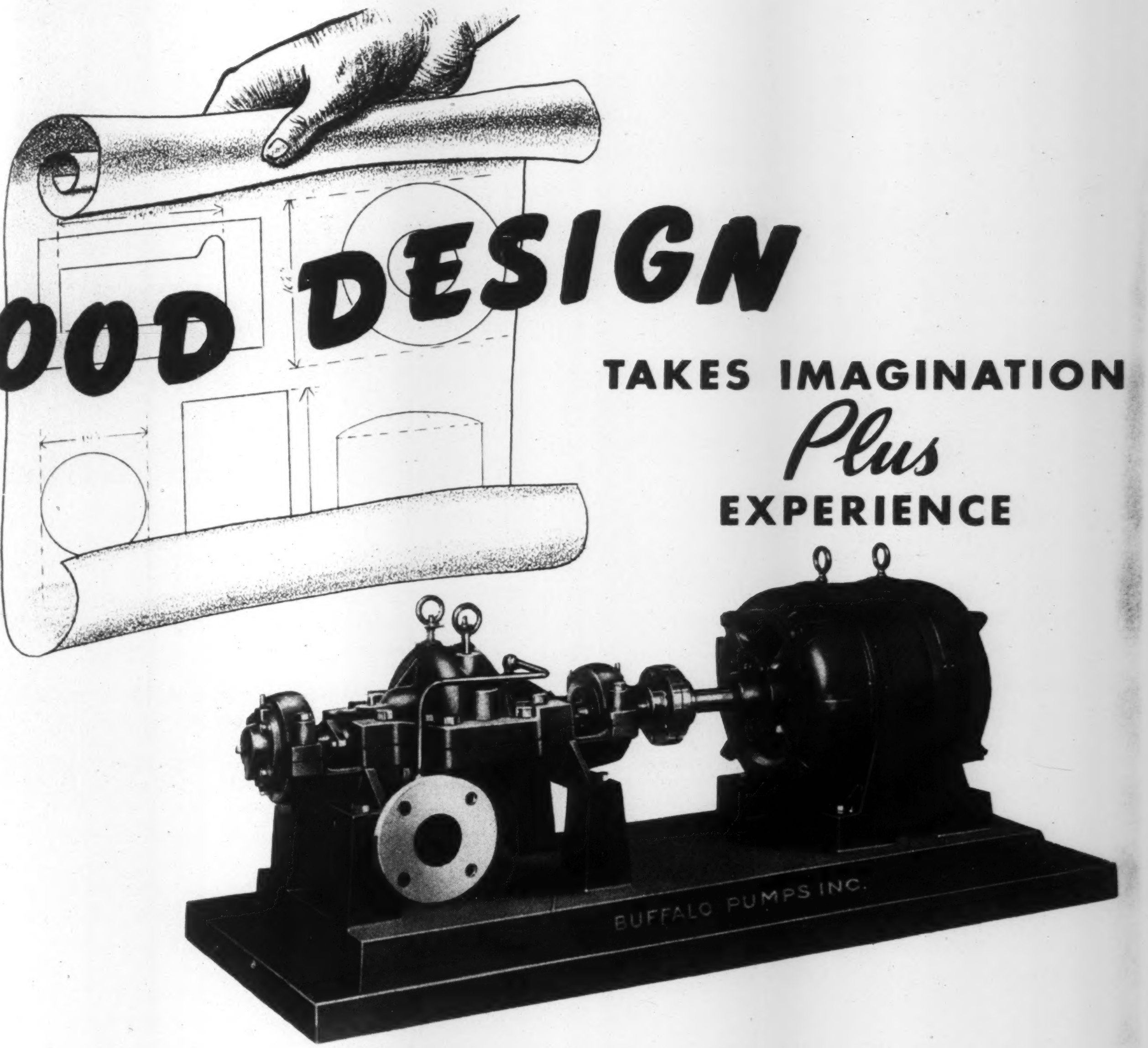
Gas Leak Detector

No. 2686—A gas leak detector for barrage balloons—a flat, circular instrument—is playing a major role in guarding military installations and protecting the landing of troops on invasion beaches.

It has a porous clay back through which escaping gas is absorbed to push against a nylon diaphragm. A gage connected to the diaphragm registers the rate of gas escape as the device is moved by hand over the balloon surface.—Johnson Service Co., 507 E. Michigan St., Milwaukee, Wis.

Brushing Wheels Reclaim Old Pipe

No. 2687**—One of the oldest and simplest power brushing operations—metal cleaning by wire brushing wheels—has become increasingly important recently due to its widespread application in reclaiming old, rusty discarded pipe, according to the manufacturer. Effectiveness of the cleaning method is shown in the illustration, which gives a comparison of the clean section of pipe at the left with the original rusted and corroded surfaces at the right before cleaning. Depending upon the size of pipe, combinations of two, three, four or more wire brushing wheels with disc center are mounted on a spindle powered by a stationary electric motor. The wire wheels, of about 33 ga wire, revolve at 1800



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TAKES IMAGINATION *Plus* EXPERIENCE

IMAGINATION to find a way out of mechanical difficulties — experience to know whether the solution is practical.

The design of the Buffalo "RR" Pump called for a decided departure from previous practice—but results justified it. These pumps are giving excellent performance on boiler feed and other clear water service. Their rugged construction means low maintenance cost, initial high efficiency is mantained in service.

Write for Bulletin No. 980-A which gives complete details.

BUFFALO PUMPS, INC.

171 Mortimer St., Buffalo, N. Y. **Canada Pumps, Ltd., Kitchener, Ont.**

ARMY E NAVY

"Buffalo" CLASS RR PUMPS

REMOVE OIL and MOISTURE from STEAM and AIR with COCHRANE SEPARATORS & PURIFIERS

Keep the Steam You Use CLEAN and DRY
Keep Compressed Air PURE

HORIZONTAL ALL-SERVICE SEPARATOR

For Horizontal Pipe Lines
•
For Exhaust Steam
Live Steam · Compressed Air
The most popular all-service separator on the market. Thousands in use. Adapted to restricted locations.

VERTICAL ALL-SERVICE SEPARATOR

For Vertical Down-Flow Pipe Lines
•
For Exhaust Steam
Live Steam
Compressed Air
Highly efficient · One-piece Construction · Self-Cleaning · Low in Cost

LOW-PRESSURE SEPARATOR

For Pressures up to 75 lbs.
For Exhaust Steam · Low-Pressure Live Steam
Exceptionally Large Port Area
Self-Cleaning · Welded Construction

RECEIVER SEPARATOR

Wherever large quantities of water are to be expected.
Receiver takes care of extra large flushes of water due to condensation.

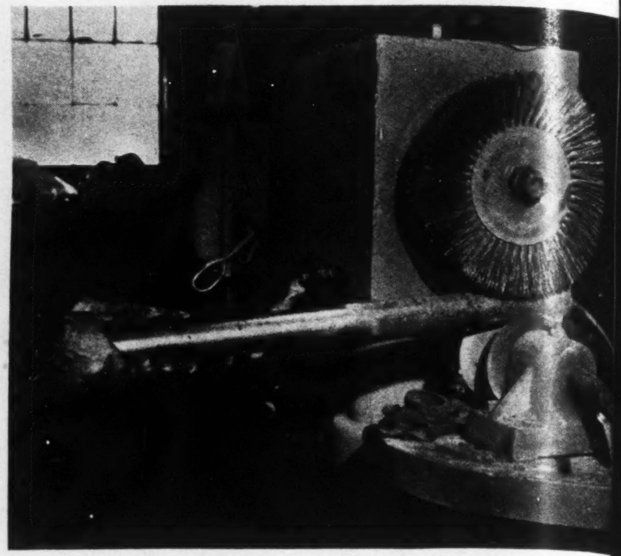
STEAM PURIFIER

The danger and inefficiency of wet dirty steam and slugs of water due to priming and foaming are eliminated with the installation of a Cochrane Purifier. Boilers have often been doubled in capacity by this simple method delivering dry pure steam at higher pressures.

Descriptive Bulletins with tables of sizes and capacities will be mailed on request. Write today stating type of equipment you are interested in, or nature of purification problem.

COCHRANE CORPORATION • 3131 N. 17th STREET, PHILADELPHIA, PA.

COCHRANE



rpm. The pipe is inserted between a roller mounted o the bottom of the unit and the operator moves the pip back and forth about 10 to 12 in. at a time under th revolving brushes, rotating the work slowly to clean al sides.—Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, Ohio.

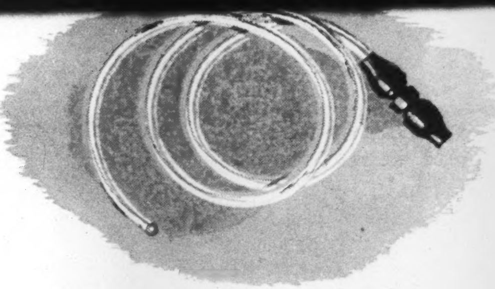
Repairing Motors by Means of Low Temperature Welding

No. 2688—In recent issues of the Eutectic Welder two repair jobs on electric motors have been described One job was a squirrel cage rotor with loose connections on the end ring and another on a worn armature shaft.

Loose connections between the copper short circuiting or end ring and the copper rotor bars often cu down the speed of squirrel cage motors. These joints between the end rings and the rotor bars are ofte soldered to avoid overheating the steel laminations which are only a short distance away. Therefore, t make a satisfactory repair, it is necessary to choose a welding or brazing rod that can be applied quickly at a minimum temperature and in addition develop good strength and conductivity. Considering these requirements, "EutecRod 1800," used with "Autochemic Eutector Flux 1800," was selected. This rod will flow freely on copper between 1150 and 1200 F, and the resulting joints will develop the full strength of copper and show excellent conductivity, says the manufacturer.

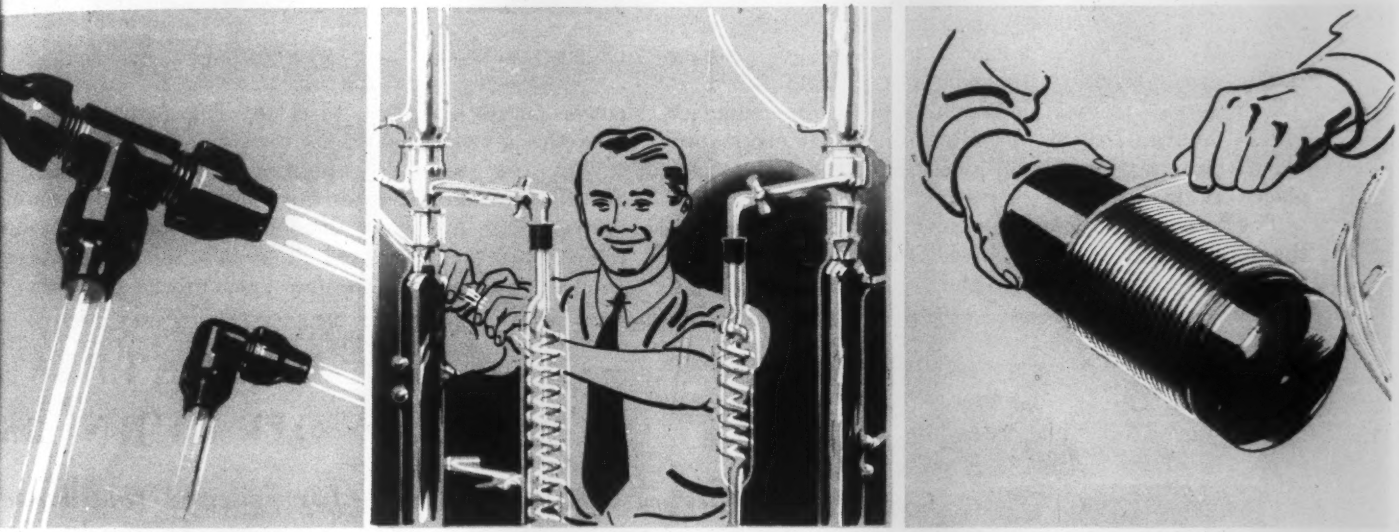
To obtain the best results, all traces of previously used solders or brazing alloys were removed from the joint and all grease and oxides removed from the surface of the metal in the weld area. The joint was then painted with the flux. Two torches were used, each adjusted to a slightly excess acetylene flame, to bring the heavy laminated copper end ring up to the proper temperature before the heat could run down the copper rotor bars and warp the steel laminations. As the heat was applied, the melting of the flux indicated that the proper temperature had been reached to apply the brazing alloy. The alloy flowed freely around the joint making a neat fillet around each bar. When the motor was reassembled, it ran up to its rated speed.

A worn armature shaft was to be scrapped becaus



Why Saran Tubing Will Serve in a Wide Variety of Jobs

ran Tubing is chemically resistant... noncorrosive... nonscaling... tough flexible... it is easy to install... long lasting in proper applications...



Because of its many unusual properties, Saran tubing can often be used where service requirements are too severe for other materials.

Laboratories, for example, have long experienced difficulty with tubing because of the nature of the liquids with which they deal. Ordinary tubing soon deteriorates and requires frequent replacement. Saran tubing, however, can "take it," because one of its outstanding properties is the ability to resist most acids and metallic alkalies.

Saran tubing accommodates both high and low pressures. It withstands freezing and is heat-resistant up to 170°F. It is tough yet flexible—sections flexed through a 30-degree arc 1750 times per minute for 2,500,000 flexes have not ruptured.

Saran tubing can be bent to a radius of from two to three times its diameter without kinking. Or can be permanently shaped by heating and cooling.

Licensed fabricators produce this durable thermoplastic tubing in sizes ranging from 1/8" to 3/4" O.D. with fittings to match. The fittings are made of Saran—the same remarkable material used to extrude the tubing.

Complete details are available upon request.

THE DOW CHEMICAL COMPANY, MIDLAND, MICHIGAN
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DOW PLASTICS INCLUDE—*SARAN, STYRON, ETHOCEL, SARAN FILM AND ETHOCEL SHEETING*

SARAN *PIPE*

DOW

CHEMICALS PLASTICS MAGNESIUM

it was scored so close to the windings. When it was learned that "Bronzochrom EutecRod 185" would bond to steel at 1000 to 1200 F, it was decided to apply this hard bronze on the scored section of the shaft.

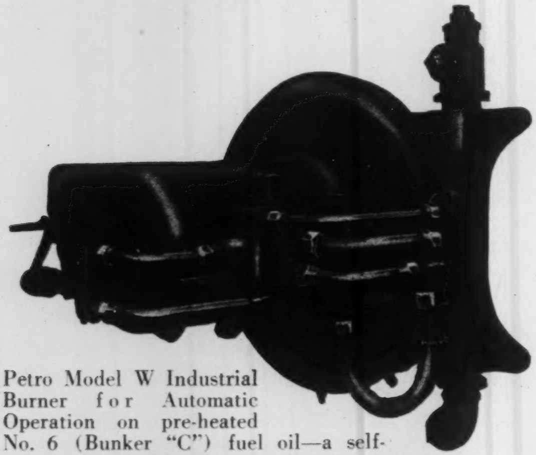
The windings were covered with wet asbestos to protect them from the flame and the scored section painted with "Autochemic Flux 185." Using a fairly large tip with a neutral flame the shaft was quickly and evenly preheated until the flux began to melt. This indicated that the bonding temperature of this rod had been reached and it was quickly applied in thin layers, alternating from side to side to avoid warping the shaft. As soon as sufficient bronze had been applied the shaft was cooled in water to prevent the heat from running down into the windings and affecting the insulation. The armature was then placed in a lathe, found to be true and turned down to the required size.—Eutectic Welding Alloys Co., 40 Worth St., New York 13, N. Y.

Air Conditioned Wind Tunnel

No. 2689—The altitude wind tunnel has been placed in operation at the NACA aircraft engine research laboratory in Cleveland, marking the addition of a valuable unit to the nation's aeronautical research facilities. Following the basic design laid down by the National Advisory Committee for Aeronautics, the Pittsburgh-Des Moines Steel Co., Pittsburgh, provided the detailed design, constructed the tunnel, and placed it in complete operating condition.

The tunnel is unique from several standpoints. It is the first of its kind for investigating under altitude conditions aircraft power plants as installed in airplanes. It is said to be the most complete equipment as yet developed for getting the "bugs" out of entire power plants designed for high altitude operation before the airplane goes into production.

The test section of the tunnel has a diameter of 20 ft, sufficient for testing engines of 3000 hp or more. The tunnel is designed to simulate subzero temperatures encountered at 30,000 ft, and is strong enough to simulate pressures encountered at 50,000 ft.



Petro Model W Industrial Burner for Automatic Operation on pre-heated No. 6 (Bunker "C") fuel oil—a self-contained assembly of motor, fan, pump, rotary cup atomizer and interlocked air and oil adjustments.

PETRO REG. U.S. PAT. OFF

INDUSTRIAL OIL BURNERS

Cut Steam Costs — ***for reasons familiar to good heating men — such practical reasons as:***

1. Each Petro System is designed to meet and handle efficiently the operating necessities and characteristics of the plant it is to fire.
2. The units and accessories thus incorporated into each system are, in themselves, designed for maximum functional excellence, based on 38 years of oil burning experience.
3. Each such system maintains its specified firing performance and combustion efficiency at a fixed constant, even when the fuel is No. 6 oil—pre-heated—because the Petro Thermal-Viscosity System entirely eliminates frequent and manual compensating adjustments.

FOR AUTOMATIC — SEMI-AUTOMATIC — or MANUAL OPERATION

Capacities—to 145 gallons per hour—454 Boiler h.p.—68,000 Sq. Ft. Steam

Heating Engineers and Contractors know that, while completely automatic firing is the aim of cost-conscious management, because of its large labor-cost reduction, there are various operating circumstances which create sound reasons for using other firing methods. Consequently, there is Petro equipment for any of these necessary modifications, and for pre-heated fuel oils as well as for No. 5 (or lighter) oils.

Petro's complete engineering service is available to established contractors on oil burner installation problems. Layout and application data; suggestions; possible alternatives in specific problems; and drawings and specifications, if necessary, are part of this Trade service.

"Petro's Engineering Division will gladly answer questions—full data on Petro Industrial Burners are in Sweet's—or Domestic Engineering—catalog files. Details on Petro Domestic Burners available in separate catalog. Copy of either sent gladly on request."

PETROLEUM HEAT & POWER COMPANY

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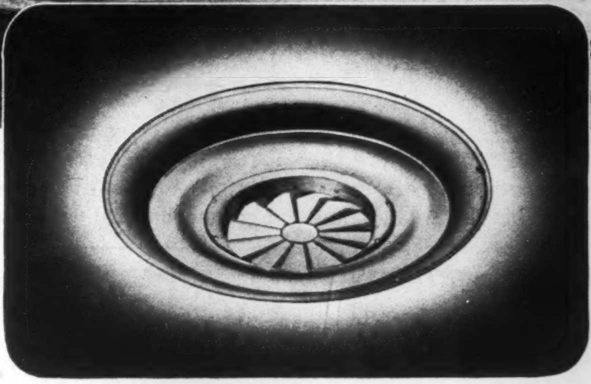
STAMFORD **CONNECTICUT**

Above, Douglas Aircraft Company plant at Oklahoma City, Okla. Photo courtesy of Douglas Aircraft Company.



Left. Barber-Colman VENTURI-FLO Overhead Air Diffuser, hundreds of which are used in this Douglas plant.

BARBER-COLMAN OVERHEAD AIR DIFFUSERS

IN THIS Douglas Aircraft Company plant at Oklahoma City the famous C-47 Skytrain is made. The plant has two miles of windowless "breathing" walls and required some 17,000,000 bricks in its construction, which will give some idea of its tremendous size. Heating and cooling is accomplished through a carefully engineered duct system set high up in the trusses which support the 40-foot ceilings of the enormous assembly rooms. From these ducts the air is directed to the working area on a predetermined pattern through hundreds of Barber-Colman VENTURI-FLO Overhead Air Diffusers like the unit illustrated above. This type unit serves a double purpose — for cooling it diffuses outward, so the cool air may settle; for heating it diffuses downward, forcing the warm air directly to the working level from which it will rise. There are many other potential applications in industrial buildings for specialized diffusers of this type. Write us for further details on the use of these units and our system of *Guaranteed Air Distribution.*

venturi-flo

OVERHEAD AIR DIFFUSERS

BARBER-COLMAN COMPANY

1228 ROCK STREET • ROCKFORD, ILLINOIS

The photo shows guide vanes in the tunnel for turning the high velocity air stream.

The refrigerating plant provided to produce altitude temperatures in the tunnel test section has a refrigerating capacity which, if utilized for ice making, would manufacture 10,000 tons of ice each 24 hr. Twenty thousand gallons of cooling water per minute are required to transfer the heat removed to the surrounding air via the cooling tower.

The total power required by the tunnel to test a 3000 hp aircraft engine at 30,000 ft and 500 mph air speed is in excess of 50,000 hp.

Because of the fact that power plants are operated in the tunnel, provision has to be made for cooling the air in the tunnel and disposing of the engine exhaust gas. The installation therefore includes cooling radiators, intake air ducts, and an exhaust air scoop that are not normally parts of an aerodynamic wind tunnel.

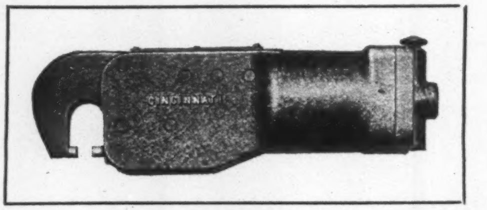
The tunnel is of steel construction using an alloy especially adapted to temperature changes and is supported through steel rollers on concrete piers in such a manner as to provide for movement in any direction to permit expansion and contraction of the steel shell. Heat losses are minimized by an insulating layer of glass wool which is in turn covered by a steel cover. An 18,000 hp electrical motor drives the 31 ft diameter, 12 bladed propeller on an extension shaft from outside the tunnel shell.

Both tunnel and engine under test are controlled from an adjoining soundproof control room, where the operator governs the pressure, temperature, air speed within the tunnel, angle of attack of the model, and operation of the engine and propeller. Instruments indicate the forces on the model as well as complete performance data.

Low air pressures are maintained within the tunnel by means of four Worthington reciprocating exhausters located in a nearby building and connected by large ducts to a streamlined scoop down stream of the model.

The ventilating air removed by the exhausters is replaced by air dried by Pittsburgh Lectrodryer chemical dehumidifiers and refrigerated by York equipment. The main refrigeration of the wind tunnel is accomplished by means of a copper plate fin type of heat exchanger located in the 51 ft diameter end of the wind tunnel and connected to 14 Carrier refrigerating units installed in the refrigeration building.

Squeeze Type Riveter



No. 2690**—The "Cincinnati" pneumatic squeeze type riveter illustrated here, for driving tight rivets with uniform heads and without distorting the surrounding metal, is light in weight, speedier in operation, and more economical to use, says the manufacturer. Depressing the button causes the riveter to go through its complete cycle of operation. "Engineering refinements and mechanical improvements have reduced the bulk

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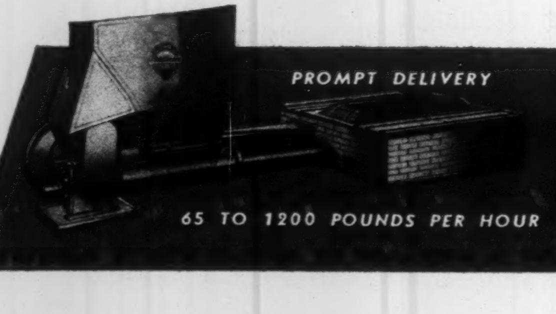
This is the stoker line that you can depend on for profitable sales now to coal users burning 25 tons or more per year . . . and for still more profitable volume just as soon as domestic models are again available!



Freeman is a pioneer of the stoker industry and one of the leaders in national sales volume . . . offers you a complete line, a sales-proven promotion program, and the security of a dependable, financially strong manufacturer who will always be in the stoker business to serve you! It will pay you to get full details . . . immediately.

[illegible] ILL.

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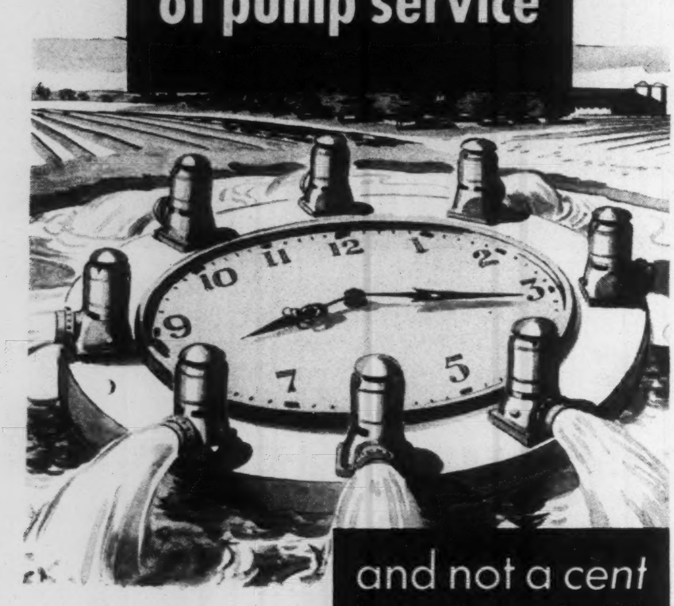

and not a cent for repairs

Here is a typical Peerless performance record: A Peerless Deep Well Pump was installed January 29, 1939, in one of the "toughest" pumping locations in America. It was pulled June 2, 1944, to permit installation of another Peerless Pump of greater capacity. For almost 5½ years it was operated at an average of 10 hours daily, with a total of 20,714 hours of meritorious service. Never was a single cent spent on repairs. After pulling the pump, inspection revealed no appreciable wear. It has been installed in a near-by well and is expected to give years of additional service with little or no repair cost. This is the kind of service for which Peerless is noted—low cost of upkeep and unfailing dependability. Make Peerless your choice if economy is your objective.

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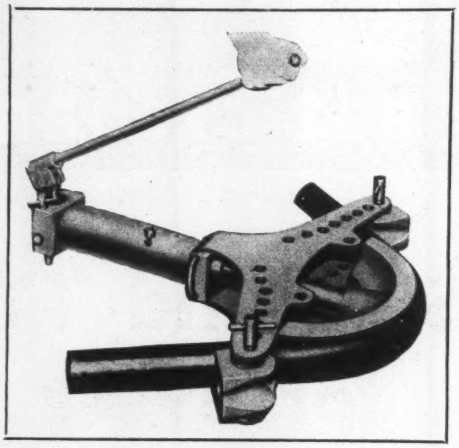
Other Factories: San Jose 5, Fresno 16, California

and weight, as well as the amount of compressed air required."—Schauer Machine Co., Reading Road, Cincinnati 2, Ohio.

Portable Pipe Bender

No. 2691—A pipe bender which requires no heating or filling, and—according to the manufacturer—produces uniform bends without kinks or wrinkles, was recently developed. It will bend iron and steel pipe and conduit from ⅜ in. up to 4½ in. in one operation without moving the pipe. It operates by hydraulic power and is readily portable. It is suggested by the manufacturer as ideal for radiant heating installations. This bender is obtainable in three sizes.—Tal's Prestal Bender, Inc., 225 N. Water St., Milwaukee, Wis.



Hose Clamp

No. 2692**—A new hose clamp available from ¾ in. to 48 in. ID is a mechanical device for connecting various kinds of male and female fittings, special nipples, or ordinary pipe to hose. According to the manufacturer, all hose (from modern high pressure wire woven and braided hose used in control of hydraulic machines, pneumatic tool hose, sand blast hose, or any kind of flexible coupling between rigid pipe lines or fittings for air, steam, bituminous materials, gasoline and oil down to ordinary air and water hose) may be fitted with this clamp. In making the connection a broad, high strength steel band is double wrapped around the joint. After tensioning with a pull within the locking tool, the ends are locked together under tension with a steel clip and the excess is cut off flush with the clip so that the entire joint is "streamlined for safety."—Punch-Lok Co., 321 N. Justine St., Chicago 7, Ill.

Magnetic Type Air Circuit Breaker

No. 2693—A new "Ruptair" magnetic type air circuit breaker has been developed and is available in high voltage, oil-less switchgear rated 5000 volts and below, and 150,000 kva interrupting capacity and below. This breaker has overall dimensions as compact as standard oil breaker switchgear, with all parts readily accessible, says the maker. The arc chute has been carefully coordinated with the contact and arc runner design to give consistent and reliable interruption through the entire range of current to be interrupted. Complete inspection and maintenance of the contact assembly can be accomplished without disturbing the arc chute or magnetic circuit, it is stated.—Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.

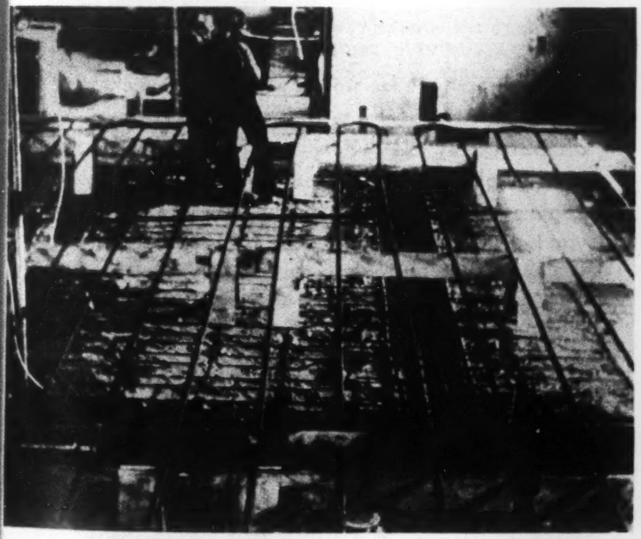
Compressor Control

No. 2694—The "Ashcroft Compressor-Trol" is a new instrument which, according to the manufacturer, combines seven devices for the control of air compressor operation into a compact unit. Made in three sizes, ½, ¾, and 1¼ in., it is designed to cover all requirements of tank mounted compressors up to 15 hp or 60 cfm. It is equipped with a switch with either an electric or mechanical attachment for operating the two way unloading valve. A muffler on the compressor discharges into the tank, the muffler acting to break up the discharge "to insure adequate mixing with the cooler gases in the tank to reduce the temperature and moisture content before delivery." The combined switch and gage has a heavy duty, gearless movement, slide rule dial, horizontal selfdraining and nonfreezing bourdon tube, and the entire gage is completely removable and replaceable in case of accident or damage, says the manufacturer.—Ashcroft Gage Div., Manning, Maxwell & Moore, Inc., Bridgeport 2, Conn.

Wrought Iron Coils for Radiant Heating

No. 2695—Hodge Boiler Works, East Boston, Mass., recently decided to gain some first-hand knowledge of radiant heating by installing it in a 40 x 26 ft addition to its offices.

The 1 in. wrought iron pipe coils, spaced on 15 in. centers and through which hot water is circulated from the same boiler that supplies the standing radiator system in the rest of the plant, are laid level under the terrazzo floor. The photo shows the coil layout in place before the floor slab was poured.



Advantages of the completely concealed system are said to be "greater comfort (most desirable room temperature with radiant heating is in the middle 60's), improved cleanliness, elimination of air currents, ability to use all floor and wall space, and fuel economy ranging up to 30 per cent."—A. M. Byers Co., Clark Bldg., Pittsburgh 22, Pa.

"Sunkist" office building—Los Angeles headquarters of California Fruit Growers' Exchange — heated with two 23-section Mueller Gas-fired Steam Boilers.

MUELLER

Gas-fired Boilers

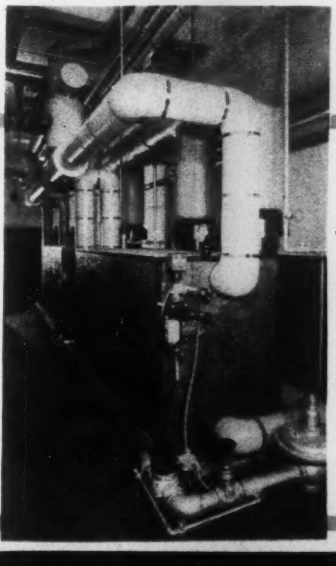
. . . *the selection you're always proud of*

Select a prestige line — and you add to your own prestige. *That's Point No. 1* for Mueller Gas-fired Boilers — built by a pioneer in the gas boiler field — well-known among architects, building contractors, gas companies—part of a nationally advertised line.

Select a gas boiler that lives up to its reputation—and you get easier installations, greater satisfaction among owners and tenants, fewer service troubles. *That's Point No. 2* for Mueller Gas-fired Boilers.

These all-cast-iron gas-designed boilers embody definite Mueller features that assure fuel economy, easy maintenance, long life. All castings assembled and pressure-tested at the factory; you get a positive, water-tight assembly. Surface-ground iron-to-iron contacts. Easily cleaned. Simple non-mechanical burner and complete automatic controls. Write for bulletins. *L. J. Mueller Furnace Co., 2007 W. Oklahoma Ave., Milwaukee, Wisconsin.*

E-11



Adaptable to steam, hot water (gravity or forced circulation), or vapor heating; direct or indirect hot water supply. AGA ratings 290 to 20,100 sq. ft. (hot water), 180 to 12,600 sq. ft. (steam or vapor) with one set of controls. Groups or batteries in any required capacity.

Series A and AE for residences and small commercial installations.

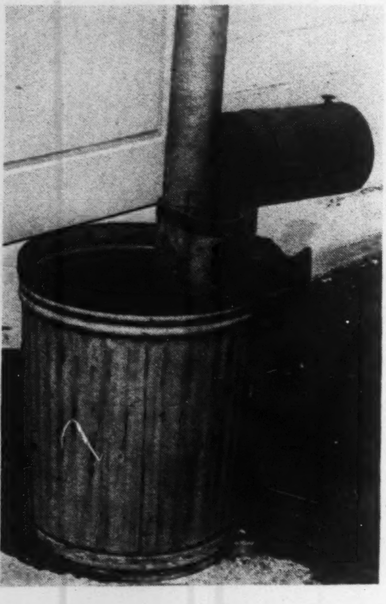
Series C (at left, as installed in Sunkist office building) for larger residences, apartments, stores, commercial and industrial buildings, etc.

MUELLER *Milwaukee*

GAS-FIRED BOILERS AND UNIT HEATERS

Immersion Water Heater for Army

No. 2696—The problem of heating water in field operations has been greatly simplified by development of the immersion type water heater with which the Quartermaster Corps will replace the former style issued with the M-37 field range.



Selected for its simplicity of operation, it requires fewer replacement of parts and operates on any type of fuel—gasoline, light fuel oil, or kerosene. Through application of the immersion (operation under water) principle, the heating efficiency is increased and a 24 gal can of water can be brought to a boil in about a half hour.

The heater consists of a burner, a watertight combustion chamber, 8 ft 4 in. tall, and a fuel tank with a valve which allows the fuel to drip into the burner. It hooks onto and sets down inside the water container and may be lifted out for moving or emptying the container. It weighs slightly more than 50 lb.

The usual water receptacle used in the field is the well known 24 gal Army can, which is about 24 in. deep. When the heater is placed in this container, the combustion chamber rests on the bottom; the fuel tank stands just above the edge of the can and the valve is set over a cup connected to the burner by a pipe.

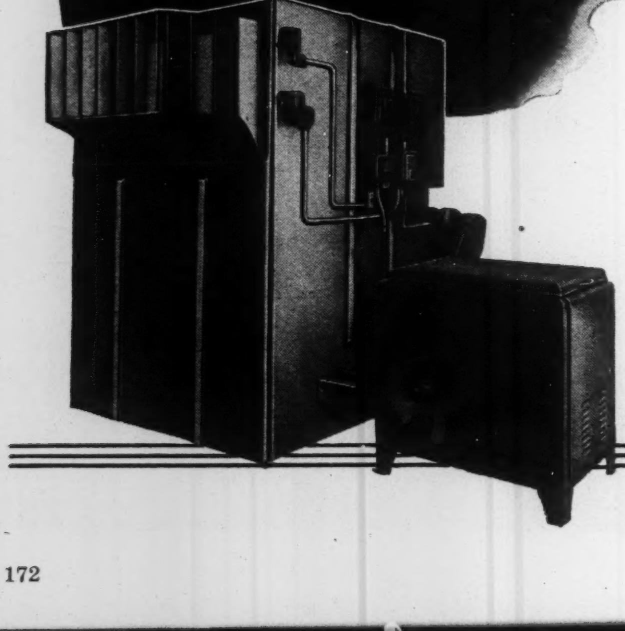
The burner is in the combustion chamber, shaped like a hollow doughnut, which consists of two concentric cylinders; the inner cylinder acts as an obstruction which causes the flame to pass around it, thereby insuring a large heating surface.

The draft is produced by the tall stack connected with the combustion chamber. It is lighted by use of a torch consisting of an asbestos rope-end fastened onto the end of an iron wire; it is extinguished by turning off the fuel valve. Rate of heating is readily controlled.
—Bureau of Public Relations, War Dept.

Army Policy on Installation of Air Conditioning and Ventilation

War Department policy for the installation of air conditioning, cooling, and ventilation in Army installations in the continental United States is set forth in a circular No. 148 recently issued. This circular, with its schedule and map, amplifies the policy set forth in the Army and Navy Munitions Board list of prohibited items for construction work for the installation of air conditioning or mechanical cooling, evaporative cooling, and mechanical ventilation.

Section II, ASF circular No. 143, 1943, should be consulted for allowable uses of "Freon-12."



Airtherm Direct-Fired Unit Heaters Give You Warm Air Heat Only Where and When You Want It!

✓ You operate the Directherm Unit only those hours when you need heat—absolutely no waste of fuel due to stand-by loss. There is no danger of freeze-up when the unit is turned off over night.

The Directherm Heater has a minimum number of parts, high efficiency on the combustion chamber, comparatively low outlet temperature, and a horizontal high velocity air stream with adjustable wide angle of warm air delivery. Can be adjusted to give you heat only *where* you want it, *when* you want it.

The Directherm Heater is scientifically built in 6 standard sizes with capacities from 300,000 to 1,500,000 BTU's.

Write today for bulletin giving complete details and specifications on this versatile, efficient heating unit.

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Featuring this third edition are several entirely new chapters on phases of the subject not previously treated, including noise control, air conditioning measurements, air conditioning standards, fire protection codes and operating suggestions. Brand new designing examples are also used, together with new forms for recording the design data, the proper filling-in of which is explained step-by-step.

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Engineers in air conditioning will find the new "Air Conditioning for Comfort" invaluable as a reference book, while salesmen, students, and others may rely on it to give them a clear knowledge of fundamentals, and of the latest air conditioning methods and equipment.

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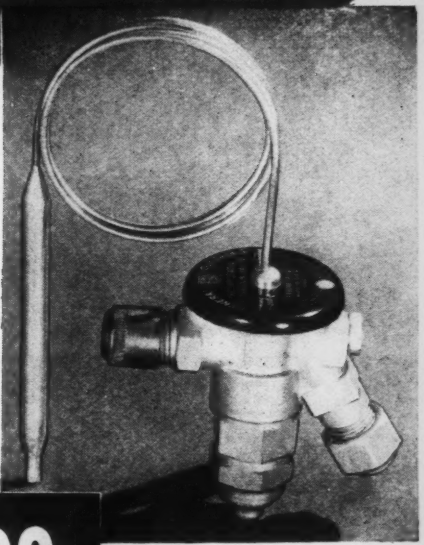

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- ✓ **Easily-removed** *orifice cartridges eliminate need for stocking several sizes for low tonnage installations.*
- ✓ **Interchangeable** *orifice cartridges assure proper sizing of capacity to load.*
- ✓ **Ample** *diaphragm plus balanced, low-rate adjusting spring.*
- ✓ **Carefully-lapped** *hard-faced ball insures tight shut-off.*
- ✓ **Frictionless** *pusher pin.*
- ✓ **Semi-liquid charged;** *may be placed in ambient temperatures higher or lower than bulb temperatures with no loss of control.*
- ✓ **Unmatched** *sensitivity.*

For complete specifications on the V-200 and other refrigerant controls in the broad GENERAL CONTROLS' line, write for your copy of Catalog 52. Send request to your nearest GENERAL CONTROLS branch or sales and service agency.

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Ammonia Distillers

No. 4772—2 p. bulletin (334-A) on distillers for purifying ammonia in refrigerating plants by removing impurities such as water and oil. Diagrams showing methods of connecting the distillers, and installation and operating instructions are given.—Frick Co., Waynesboro, Pa.

Arc Welding Design

No. 4773—Series of looseleaf sheets on practical design for arc welding, by Robert E. Kinkead, consulting engineer. Included are sheets on light machinery base corners, stiffeners for light sheet metal construction, machinery frame and bearing blocks, and a ship ventilator and chimney wind scoop.—Hobart Brothers Co., Troy 1, Ohio.

Blower Wheels and Housings

No. 4774—8 p. bulletin (75) on single inlet blower wheels and housings giving quick facts on their features, sketches, and tables of dimensions. Curves of wheel performance are included.—Lau Blower Co., 2001 Home Ave., Dayton 7, Ohio.

Central Heating

No. 4775—6 p. folder on postwar community planning and central heating, with information on heating costs for various community developments and stressing the use of prefabricated pipe conduit and its advantages.—Ric-wiL Co., 1562 Union Commerce Bldg., Cleveland 14, Ohio.

Controls

No. 4776—2 p. bulletin (J303-2) describing the "Rheotrol," a device to maintain desired electric power or heat input, or flow of liquids or gases to any process or equipment. Also a 2 p. bulletin (J402-2) and a 4 p. bulletin (J403-2) on automatic and manual type "Inputrols," which are simplified electrical timing devices, and when employed with an automatic control instrument having a high and low contact with a neutral position, maintain desired input of electrical power, heat, or flow of liquids or gases. Also 4 p. bulletin (J602-2) on the "Throttltrol," a simplified valve positioning device used in conjunction with any control instrument having a high and low contact with a neutral position.—Wheelco Instruments Co., Harrison and Peoria Sts., Chicago 7, Ill.

Cooling Towers

No. 4777—32 p. bulletin (700-A) on double flow horizontal induced draft cooling towers, with sketches and description of their design and construction features, and with numerous attractive illustrations of typical stallations, including a number for air conditioning rvice.—Marley Co., Inc., 3001 Fairfax Rd., Kansas y 15, Kans.

ectronic Air Cleaners

No. 4778—24 p. booklet on "Precipitron" electronic air cleaners, discussing the principle and advantages of this method and describing its application in various industries and buildings, and listing numerous installations, showing the cfm capacity of each, classified as to types of industries and buildings. Also an 8 p. booklet on electronically cleaned air for postwar railroad cars, discussing advantages of the method in this application. Also 8 p. descriptive bulletin (59-200) on oil mist control units for industrial applications with suggested application methods, dimensions, etc. Also 8 p. descriptive bulletin (59-130) on electronic air cleaners for industrial and commercial applications, including bill of materials furnished by the manufacturer, information on construction of equipment, accessories, selection, capacities and dimensions, etc.—Westinghouse Electric & Mfg. Co., Cleveland, Ohio.

Fans

No. 4779—8 p. bulletin (442) on "Comet Exhaustair" industrial ventilating fans and accessories for handling large volumes of air at low resistance. Also 8 p. bulletin (441) on general purpose fans comprising portable self-contained units of medium capacities for low pressure industrial and ventilating applications. Also 32 p. bulletin (432) on type "SSP" industrial and heat fans designed to meet specific requirements of dust and gas removal, conveying of materials, and the handling of hot air and gases in industrial processes. Engineering data and an extensive series of capacity tables and performance curves are included.—New York Blower Co., 3155 Shields Ave., Chicago 16, Ill.

Flat Belt Drive Equipment

No. 4780—24 p. catalog (FBD-44) on flat belt drive equipment, giving information on split pulleys and bushings, shaft collars, shaft hangers and bearings, conveyor pulleys, motor pulleys, belting, and "Econ-o-matic" drives for short center applications.—American Pulley Co., 4200 Wissahickon Ave., Philadelphia 29, Pa.

Guards for Grinders

No. 4781—6 p. bulletin of drawn steel guards for grinders, including handles, hoods, hubs, clamps, sleeves and face plates. Specifications and dimensions for the various hoods are tabulated.—Morrison Products, Inc., E. 168th St. and Waterloo Rd., Cleveland 10, Ohio.

Motor Pulleys

No. 4782—8 p. catalog (HT-44) on high torque motor pulleys, describing composition, design, manufacturing methods, and advantages.—American Pulley Co., 4200 Wissahickon Ave., Philadelphia 29, Pa.

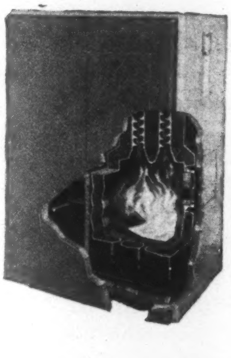
Odor Control

No. 4783—62 p. booklet on the application of "Air-kem," a chlorophyll air freshener, for air conditioning, ventilating, and exhaust systems. Among the subjects discussed are ventilation requirements, odor control by

Burnham
RADIANT WARMTH
SINCE 1873

For Saving Fuel

THE BURNHAM WAY



IN co-operation with the Fuel Saving Program, the *Burnham DeLuxe Oil Boiler* is again in production.

For more than ten (10) years this Special Oil Boiler has been showing remarkable savings in fuel oil.

It is shipped completely assembled and sealed which simplifies and speeds installation. Available with either storage or tankless type Taco Heaters.

Note: A few jackets are available for some sizes until the supply is exhausted.

Showing Storage type Taco Heater. Tankless Taco also available.

NOW IN STOCK AT ALL WAREHOUSES
Dole Air Valves
McDonnell Feeders and Cutoffs
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Burnham Boiler Corporation

Irvington, New York, Dept. P
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Export Dept.: 50 Church St., New York 7, N. Y.

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this method vs. dilution with outside air, reduction of first and operating costs, action of this product on an air conditioning system, estimating its consumption, the "Transpar" evaporator, its installation and servicing, and with a report on how the product works by Dr. W. D. Turner, professor of chemistry, Columbia University. Also a leaflet briefly describing this product and its use in air conditioning systems, and with a listing of users. Also a booklet of testimonial letters from users of the product.—W. H. Wheeler, Inc., 234 E. 46th St., New York 17, N. Y.

Power Piping

No. 4784—Issue of Sparks (Vol. 3, No. 3) devoted to power and its importance, and illustrating the part played by pipe and welding fittings in power generation.—Tube Turns, 238 E. Broadway, Louisville, Ky.

Pumps for the Petroleum Industry

No. 4785—8 p. bulletin (102) on pumps for the petroleum industry, with information for users of bulk plant pumps, truck pumps, or hand pumps.—Blackmer Pump Co., 1920A Century Ave., S. W., Grand Rapids 9, Mich.

Radiator Traps

No. 4786—Leaflet on the importance of testing radiator traps before the start of the heating season and describing the manufacturer's facilities for testing traps and replacing worn parts.—William S. Haines & Co., 12th and Buttonwood Sts., Philadelphia 23, Pa.

Safety and Relief Valves

No. 4787—164 p. catalog of "Consolidated" safety and relief valves, covering the manufacturer's entire line for all industries. The valves are illustrated, the scope of the design is given together with parts and materials, dimensions, and other general information, such as capacity tables, sizing charts, selection charts, etc.—Consolidated Safety Valve Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn.

Stud Welders

No. 4788—18 p. catalog and separate price list on electric arc stud welders developed to supply the needs of industry for a portable means to end-weld metal studs to metal surfaces. The equipment and its operating principle is carefully described and illustrated, suggested applications are shown and discussed, and the uses of the process are listed. These uses include securing all types of insulation, installing boiler insulation, securing hangers for pipe, welding studs to boiler tubes, securing plastic building materials, and many other services. A separate leaflet discusses the quick repair of damaged boiler tubes by this method.—Nelson Specialty Welding Equipment Corp., 440 Peralta Ave., San Leandro, Calif.

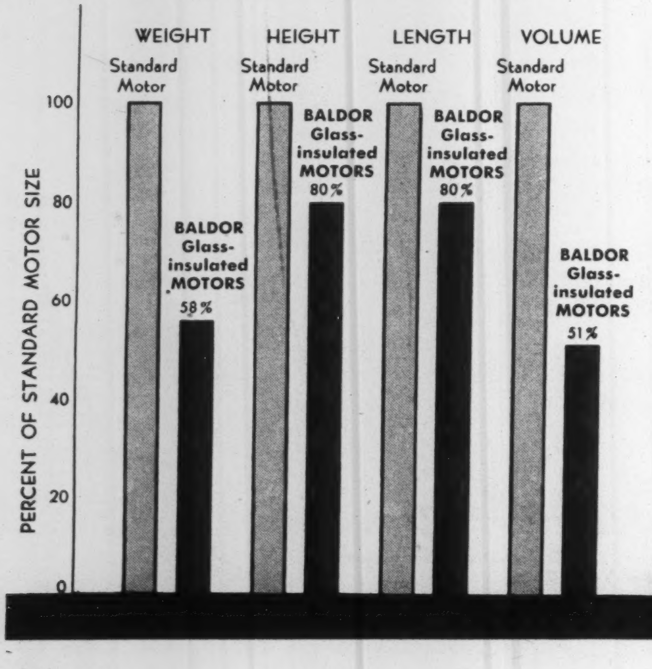
Surface Protection

No. 4789—12 p. booklet on surface protection, comprising a technical discussion of "White Hot" and "Pyro-chrome" protective coatings, which take advan-

GET ALL THE FACTS ABOUT BALDOR GLASS-INSULATED MOTORS

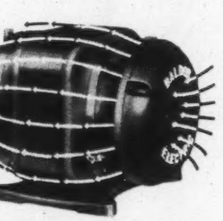
BALDOR GLASS-INSULATED MOTORS

Compared to Size of Standard Class A Insulated Motors
10 H.P. 1800 R.P.M. - Totally Enclosed Fan Cooled



Comparison chart at left shows but one of the many advantages of BALDOR Glass-insulated Motors . . . economy of size and weight. (Glass insulation makes possible 10 H. P. motor in standard 7½ H. P. frame . . . and 135 lbs., less weight.) More horsepower per pound and per square inch.

Let us tell you more about this feature and how BALDOR Glass-insulated motors withstand higher temperatures, absorb less moisture, have greater dielectric strength and other post-war musts.



Another BALDOR Engineering Achievement

. . . Streamcooled Design, providing efficient, over-all cooling of the motor by externally-mounted fan.

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District Offices in Principal Cities

BUY WAR BONDS *for keeps!*

tage of the properties of heat reflectance, and which—according to the manufacturer—is a "hitherto overlooked principle by which a substantial amount of radiant heat energy is put back to work instead of being absorbed by heat chamber linings." Refractories, metals, ceramics, and glass are substances on which these coatings have been found effective, it is stated.—Preferred Utilities Mfg. Co., 1860 Broadway, New York 23, N. Y.

Unit Heaters

No. 4790—12 p. bulletin (44-U) on "Electromode" electric unit heaters for commercial and industrial application. This line includes standard sizes ranging from 15 to 60 kw.—Electric Air Heater Co., Division of American Foundry Equipment Co., 619 S. Byrkit St., Mishawaka, Ind.

Unit Heaters

No. 4791—8 p. bulletin (144) on vertical delivery unit heaters, and 8 p. bulletin (144-A) on horizontal delivery unit heaters. Complete descriptive data on new lines of copper condenser unit heaters are provided, including sizes and steam and hot water performance tables. Also incorporated in these bulletins is engineering information on the manufacturer's low outlet temperature models designed for use on steam pressures of 30 psi and greater.—Modine Mfg. Co., Racine, Wis.

Variable Speed Transmission

No. 4792—4 p. bulletin (SJ-44) on "Speed-Jack" variable speed transmission for drives up to 1 hp, describing features and giving specifications and installation data.—American Pulley Co., 4200 Wissahickon Ave., Philadelphia 29, Pa.

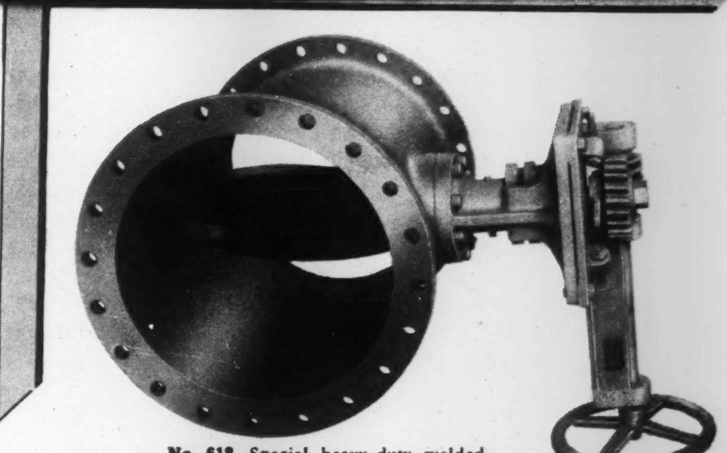
Water Conditioner

No. 4793—Leaflet describing "K. A. T." water conditioner, "an anti-scale, anti-corrosion, and anti-foam treatment" for water stills and evaporators.—American K. A. T. Corp., 331 Madison Ave., New York 17, N. Y.

MEETINGS & CONVENTIONS

Chemical Society

American Chemical Society, Division of Industrial and Engineering Chemistry, September 11-15, New York, N. Y. Symposium on inhibitors for control of scale and corrosion in water to be given Tuesday, with F. N. Speller presiding. Papers include fundamental principles governing use of soluble inhibitors, by U. R. Evans, Cambridge University; zinc, manganese, and chromium salts as corrosion inhibitors, by R. S. Thornhill, Cambridge University; protection of small water systems from corrosion, by William Stericker, Philadelphia Quartz Co.; corrosion inhibitors in aqueous media, by Nat A. Bailey and Charles E. Erb, D. W. Haering & Co.; corrosion control and scale prevention with glassy phosphate, by G. B. Hatch and Owen Rice, Hall Laboratories, Inc.; chromate corrosion inhibitors



No. 618. Special heavy-duty welded steel body unit with "H" metal vane. Heavy-duty hand wheel control for operation at 150 psi.

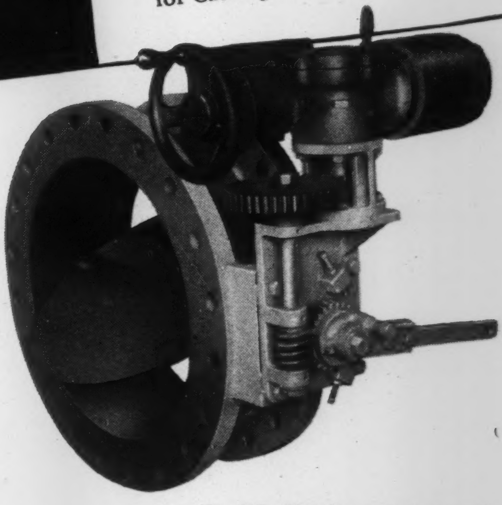
LOW HEAD LOSS SAVES POWER!

All R-S Butterfly Valves have streamlined vanes which offer minimum flow resistance. Flow conditions are similar to those produced in a venturi tube with high pressure recovery on the downstream side. Such a low head loss means a considerable saving in power particularly in large pumping operations.

Furthermore, there are no pockets, right-angle bends or reverse turns to collect sediment. When the vane approaches a closed position, the valve *tends to clean itself.*

Shut-off is accomplished by the beveled vane which wedges against the valve body. *Remember that four to six revolutions of the hand wheel completely open or close the valve vane.* Easily adapted to power operation.

If you are interested in a simplified and less costly method of control and shut-off, write. Ask for Catalog No. 14-B.



R-S

15 to 900 psi.
Control and shut-off of volume and pressure for air, gas, steam, liquids and semi-solids.

No. 617. Electric motor control for extremely slow acting valve. Hand wheel for manual operation on gear reduction drive. Extended lever for operation of sister valve in parallel line.

VALVE DIVISION

R-S PRODUCTS CORPORATION

132 Berkley Street • Philadelphia 44, Pa.

R-S Streamlined

in bimetallic systems, by Marc Darrin, Mutual Chemical Co. of America; effect of chromate and lime additions to water on the galvanic corrosion of steel coupled to nickel, by H. R. Copson, International Nickel Co.; scale and corrosion control at Army posts, by R. T. Hanlon, A. J. Steffen, G. A. Rohlich, and L. H. Kessler, of the War Department; reduction of corrosion rate in industrial recirculating water systems, by G. Frank Lebrecht, Anheuser-Busch, Inc.; and inhibitors of corrosion, by G. G. Eldredge and R. B. Mears, Aluminum Co. of America.

Indoor Climate Institute

Indoor Climate Institute, open forum and annual meeting, September 21-22, Book-Cadillac Hotel, Detroit, Mich. Conservation and postwar planning are to be featured. P. B. Zimmerman is president of the ICI and the headquarters office is in the Penobscot Bldg., Detroit.

Welding Society

American Welding Society, 25th annual meeting, October 16-19, Hotel Cleveland, Cleveland, Ohio, in conjunction with the National Metal Conference at the Hotel Statler in Cleveland. A session on piping and pressure vessels is scheduled for Wednesday afternoon, October 18, with papers on pressure vessel welding, by Edward B. McGuire, Hamler Boiler & Tank Co.; normalizing of welds in carbon-molybdenum steel pipe by 60 cycle induction heating, by I. A. Rohrig and D. H. Corey, The Detroit Edison Co.; welding of dissimilar metals, by E. C. Chapman and R. E. Lorentz, Combustion Engineering Co.; and oxy-acetylene pressure welding, by A. R. Lytle, Union Carbide & Carbon Research Laboratories.

Supply Association and Heating Bureau

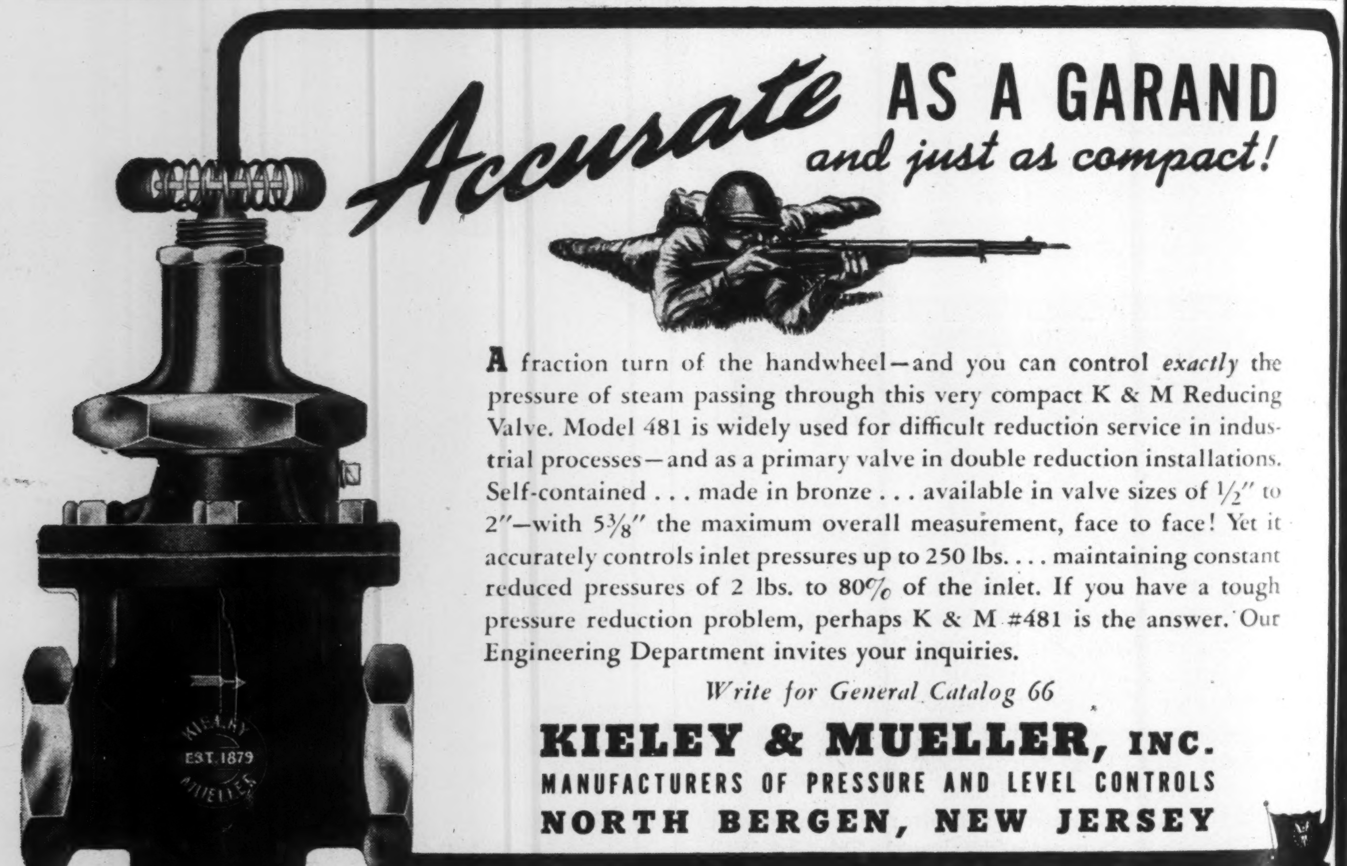
Central Supply Association, annual fall convention, October 26-27, Palmer House, Chicago, Ill. Dinner to be given Thursday evening, October 26, in honor of the 25th anniversary of the founding of the Plumbing and Heating Industries Bureau. Walter Reichle is president of the CSA, and Harry F. Beglen is president of the bureau.

Chemical Exposition and Conference

National Chemical Exposition, November 15-19, Chicago Coliseum, 15th and Wabash, sponsored by the Chicago section of the American Chemical Society. Marcus W. Hinson, 330 S. Wells St., Chicago 6, Ill., is the exposition manager. A feature of the show will be the National Industrial Chemical Conference.

Power and Mechanical Engineering Show

National Exposition of Power and Mechanical Engineering, November 27-December 2, Madison Square Garden, New York, N. Y. Apparatus for production, control, distribution, and transmission of heat and power to be featured. Charles F. Roth, president of the International Exposition Co., is manager of the show. Headquarters office is at 480 Lexington Ave., New York 17, N. Y.



Accurate AS A GARAND *and just as compact!*

A fraction turn of the handwheel—and you can control *exactly* the pressure of steam passing through this very compact K & M Reducing Valve. Model 481 is widely used for difficult reduction service in industrial processes—and as a primary valve in double reduction installations. Self-contained . . . made in bronze . . . available in valve sizes of 1/2" to 2"—with 5 3/8" the maximum overall measurement, face to face! Yet it accurately controls inlet pressures up to 250 lbs. . . . maintaining constant reduced pressures of 2 lbs. to 80% of the inlet. If you have a tough pressure reduction problem, perhaps K & M #481 is the answer. Our Engineering Department invites your inquiries.

Write for General Catalog 66

KIELEY & MUELLER, INC.
MANUFACTURERS OF PRESSURE AND LEVEL CONTROLS
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Awarded our employees for outstanding production achievement.

Packaged Power
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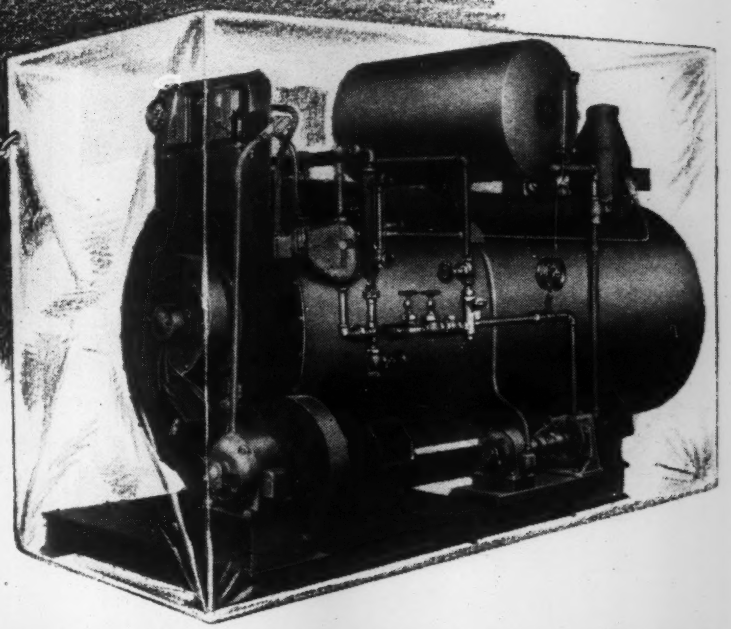
POSTWAR DELIVERY



The New O & S Powermaster Unit

is a compact "packaged" steam generating unit—fully automatic—completely wired, mounted, ready to produce low-cost steam. Although now "in the Service"—the Powermaster will get you off to a quick start when postwar production calls for a fast, efficient steamer. Get Bulletin No. 1213—write Orr & Sembower, 942 Morgantown Road, Reading, Pa.

ORR & SEMBOWER INC.
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Builders of Better Boilers Since 1885

ADSCO HEATERS *are BUILT TO YOUR ORDER*

. . . and what is equally important, ADSCO has built heaters for dozens of different applications—can design and build a heater that has the capacity, efficiency and reserve requirements exactly suited to your particular operating conditions.

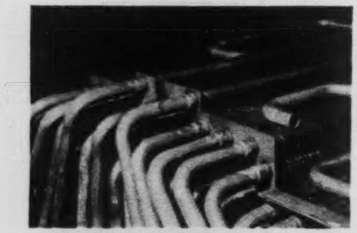
Whether you require horizontal or vertical, storage or instantaneous equipment to heat or cool water, gases, oil or other liquids, write us or send for bulletin No. 35-75HP.

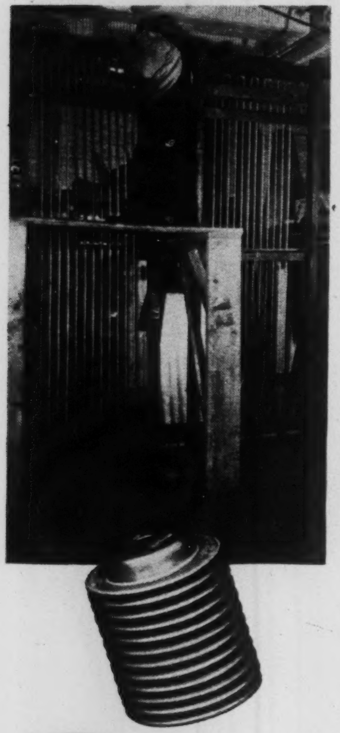
AMERICAN DISTRICT STEAM COMPANY NORTH TONAWANDA, N. Y.
Makers of "UP-TO-DATE" Steam Line Equipment For Over 60 Years

Here's why

SIL-FOS AND EASY-FLO

WILL *always* BE USED WHERE PIPING AND TUBING ARE INVOLVED





The making of strong gas-tight and liquid-tight joints in piping and tubing will always be a vital element in the manufacture and installation of heating, refrigerating, air conditioning, and other heat exchange equipment.

SIL-FOS and EASY-FLO ideally meet this need, because these two low temperature, fast-acting silver brazing alloys consistently make such joints, and do it with exceptional speed and reliability and at surprisingly low cost—a fact amply and conclusively proved by wide-scale experience with these alloys before and during the war.

It is also a mighty good reason why, sooner or later, you, too, will turn to SIL-FOS and EASY-FLO for joining piping and tubing—and for structural work also, because they make joints of unusually high strength. So why not start now to profit from their speed, reliability, product improvement and economy. As the first step—

WRITE FOR BULLETIN 12-A.

It gives full details about SIL-FOS and EASY-FLO and their uses, and tells you how to put them to work in your plant. Write today.

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[Also see pages 515 and 532, editorial section]

CIVILIAN PRODUCTION—Among the items whose production has been restricted and which will be given priority preference under the WPB's priorities regulation No. 25 permitting limited resumption of civilian goods production are air conditioning equipment, oil burners, stokers (class A and class B), water heaters, cast iron boilers, plumbing and heating tanks, domestic and commercial electric fans, and copper and steel weatherstripping.

"CONSTRUCTION" DEFINED—Inclusion of the definition of "construction" in interpretation 3 to controlled materials plan regulation 9A in order to eliminate confusion among contractors and repairmen was announced August 4 by the WPB. The definition as included in the amended interpretation makes it clear that "construction" includes "repairs," WPB officials said.

CONSTRUCTION PROCEDURES FOR UTILITIES—Simplified construction procedures for telephone and telegraph companies and electric, water, gas, and central steam heat producers have been made applicable retroactively to construction authorizations issued prior to June 10, WPB announced August 2. The procedures for new construction authorizations were first established in June.

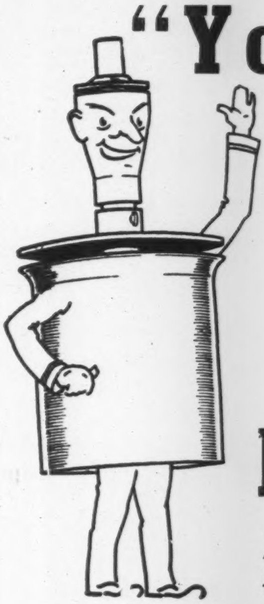
COPPER AND COPPER ALLOY—Release of frozen stocks of copper and copper alloy fittings and other fabricated building materials was announced July 31 by the WPB. Weatherstripping and 40 other items of building materials held by manufacturers, jobbers, and retailers were released by an amendment to supplementary order M-9-c-4 and may be used without restrictions. However, the delivery and installation of copper and copper base alloy, sheet, plate, roll, strip, rod, bar, extruded shapes and wire, as building materials, continues to be restricted by the order. The amended order permits the use of copper or copper base alloy pipe or tubing in connecting new water heaters which replace heaters that are worn out or damaged beyond repair if copper or copper base alloy pipe or tubing was used in installing the heater being replaced.

EQUIPMENT INSTALLATIONS—Provisions pertaining to equipment installations and installation or relocation of machinery in a structure as controlled by construction conservation order L-41 have been modified, WPB reported August 21. (Amendment to conservation order L-41, amendment to direction 2 to order L-41, interpretation 10 of order L-41, and amendment to direction 15 to CMPR 5, issued August 19.)

"FREON"—A small amount of the refrigerant "Freon 12" has been made available for distribution to theaters where lack of this refrigerant has caused acute hardship, the WPB said August 16. Theaters seeking "Freon 12" are requested to submit the following information to WPB: Weekly average attendance, number of hours per week that the theater operates, whether or not the theater has been closed because of a lack of this refrigerant, whether or not attendance has dereased as a result of a shortage of "Freon," and if so, the percentage of such decrease; the normal supply of "Freon" needed to fill air conditioning system completely and the approximate number of unused pounds of "Freon" now in the system. This information should be submitted in letter form as an appeal under Order M-28, and should be addressed to Franklyn B. Millham, General Industrial Equipment Division, War Production Board, Washington 25, D. C. Three copies of the letter are required.

HEATING EQUIPMENT—Hot water storage tanks and expansion tanks no longer require preference ratings for purchase by consumers, the WPB announced July 31. Action was taken to remove restrictions on the sale of hot water storage tanks because such tanks are used mainly to replace existing tanks which cannot be repaired. Large expansion tanks are used in commercial, industrial or institutional buildings which are automatically provided with ratings under CMP regulations, WPB officials said. Order L-79 which controls distribution of plumbing and heating equipment, was revised to state that low pressure steel boilers, designed to burn gas or oil only as a fuel, do not require ratings from consumers. Since there has been some public confusion as to the use of fuel oil and gas, L-79 has been amended to make it clear that orders issued by the Office of War Utilities and the Petroleum Administration for War control the use of these fuels. The revised L-79 also specifies that the sale of equipment using gas as a fuel is prohibited unless the prospective purchaser has obtained a letter from the utility company which will deliver the gas, stating that the gas can be delivered. The procedure for consumers to follow in applying for preference ratings has also been amended, WPB explained. The revision was made to make order L-79 conform with the recent delegation of authority to the Federal Housing Administration to process applications for purchase of building products and materials for such housing projects as come under its jurisdiction. Under the new procedure, if the equipment is to be used for residential purposes, construction or otherwise, form WPB-2896 should be filed with the nearest Federal Housing Administration field office. If that equipment is to be used for commercial or industrial purposes and is construction of a type which is restricted under the construction order, L-41, form WPB-617 should be filed with the nearest WPB field office. If not restricted under order L-41, then form WPB-1319 should be filed with the nearest WPB field office. Utilities furnishing service for use by the public should apply for equipment on form WPB-2774 with the War Production Board, Washington 25, D. C.

HOUSING PROJECTS—Rules governing construction of housing projects authorized before the effective date (March 1, 1944) of order P-55-c were clarified in interpretation 1 to P-55-c, the WPB announced August 10. Under terms of the order, housing projects authorized before the effective date of P-55-c, and for which the authorization is still in effect, may be constructed under provisions of the specific authorization received or under the provisions of P-55-c, at the election of the owner. This means that the owner may take advantage of any relaxation in the war housing critical list or

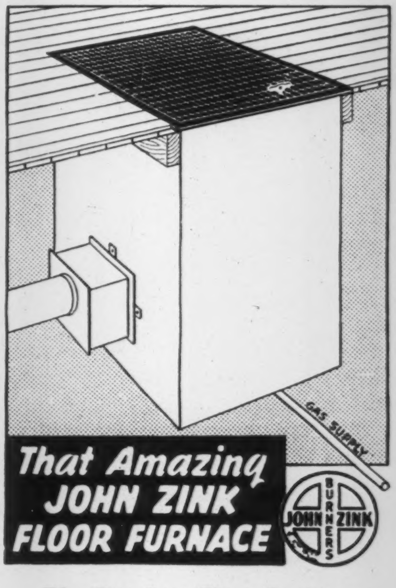


"You Can't Beat a JOHN ZINK FLOOR FURNACE"

As you would expect this furnace features a larger, improved Combustion Chamber and a One-port Non-plugging Gas Burner.

FEATURE—Rapid Air Circulation, Quiet Operation, Uniform Heat Distribution through Register, and Durability.

SIZES—The John Zink Floor Furnace is built in three sizes — the input ratings are 25,000 B.t.u., 50,000 B.t.u. and 68,000 B.t.u.



That Amazing JOHN ZINK FLOOR FURNACE

The One Port Floor Furnace

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UNIT HEATERS for Commercial and Industrial Space Heating

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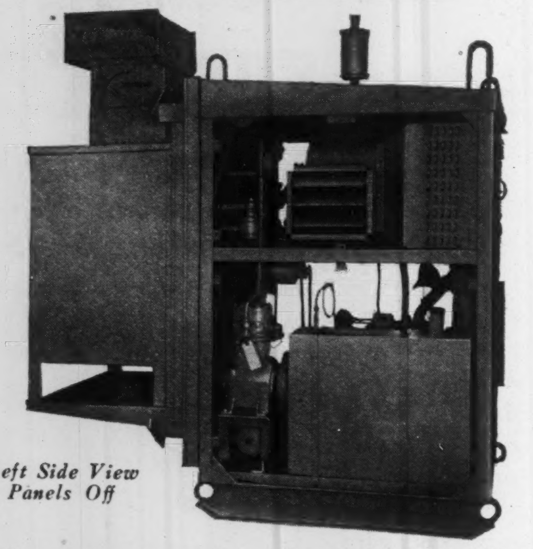
UNIVERSAL

REFRIGERATING UNITS

(FOR WALK-IN COOLERS)



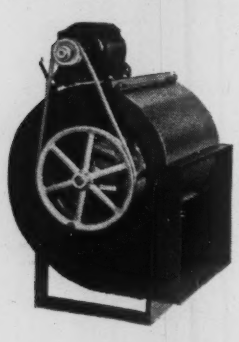
Left Side View
Panels Off

THIS automatic refrigerating unit is manufactured by the Universal Cooler Corporation, Marion, Ohio, for the armed forces for use in conjunction with "walk-in" food storage coolers. It is portable, yet it must provide dependable, long-life operation under any prevailing climatic conditions.

Among its component parts are two Lau centrifugal blowers. A Lau double unit blower draws air through the condenser and exhausts hot air from the machinery compartment. Another circulates cold air from the evaporator.

Lau blowers were selected for their advanced design; high efficiency for space required; true, vibrationless operation; long life.

If you manufacture, or plan in the future to manufacture any product in which movement of air is a prerequisite, Lau engineers will be glad to figure with you, without obligation. Write



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BLOWER COMPANY
DAYTON 7, OHIO
WORLD'S LARGEST MANUFACTURERS OF FURNACE BLOWERS

Engineers and fabricators of general Air Handling Equipment
Single Inlet and Double Inlet Blowers • Propeller Fans • Accessories

war housing construction standards as they appear in schedules 1 and 2, respectively, of order P-55-c. He may also take advantage of the method of using the preference rating and allotment symbol for acquiring materials as outlined in paragraph (d) and (e) of P-55-c.

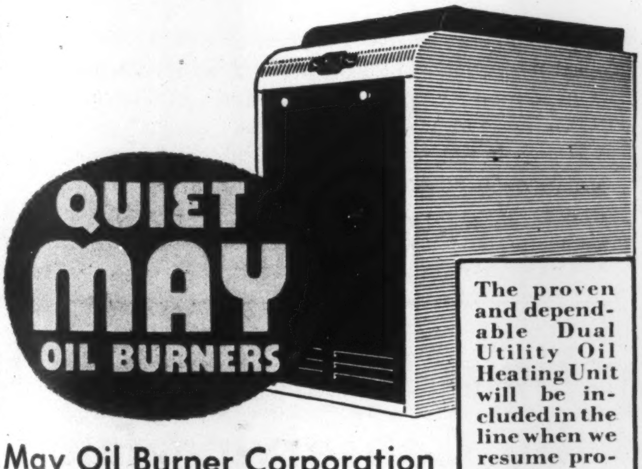
IRON AND STEEL—Restrictions on the use of iron and steel in fabrication of specific products have been revised, the iron and steel division of the WPB announced. The changes, contained in general conservation order M-126, as amended August 7, do not reflect a substantial relaxation of restrictions in the use of steel, officials said. In most cases the changes merely clarify restrictions already applicable, while others merely permit the use of special types of steel for specific products. Under the amended order, iron or steel may be delivered and used for the manufacture of several items, including floor and ceiling plates for piping, and thermometer cases and mountings.

OIL—Amendment 18 to OPA's revised ration order 11, dated August 1, pertains to acknowledgment of deliveries by exempt agencies and how exempt agencies and certain other agencies may acquire fuel oil. Because of shortage of kerosene and other heating oils, Amendment 19, dated August 11, halted issuance of fuel oil rations for hot water, domestic cooking, or domestic lighting if householder or other applicant has use of electric equipment for these purposes. Amendment 20, dated August 7, provides that where portable or nonportable space heaters are to be used, not more than 550 sq ft of floor area may be counted for each such heater, except in certain zones. Local war price and rationing boards were authorized by Amendment 21, dated August 14, to withhold fuel oil rations from anyone who destroys coal or wood burning equipment, or who sells it or gives it away without good reason, in order to obtain a fuel oil ration. Amendment 22, dated August 17, provides that a fuel oil dealer who spoils a gummed sheet by pasting on it a coupon not identical with all other coupons on the sheet must not steam the misplaced coupon off and paste it on another sheet, but must take the whole sheet to the local ration board for exchange. Two methods are provided in Amendment 23, dated August 14, by which persons who failed to sign their fuel oil coupon sheets before depositing them with their dealers may satisfy this requirement.

REFRIGERATION REPAIR PARTS—Repair and replacement parts for commercial refrigeration equipment and materials or finished goods sold to a supplier under priorities regulation No. 13 are exempt from suppliers' inventory limitation order, L-63, WPB said August 8. By amendment, L-63 includes the above items in list A, which specifies goods not defined as "supplies" within the meaning of the order. L-63, in force for more than a year, established supplier inventory controls for such items as electrical supplies, hardware supplies, automotive supplies, plumbing and heating supplies, and restaurant supplies.

TANKS—Production in excess of established quotas may be authorized for the manufacture of range boilers and expansion and storage tanks, the WPB said August 8. This provision was added to order L-199, plumbing and heating tanks, to provide a prompt method of increasing production by some manufacturers if others are unable to fill their quotas.

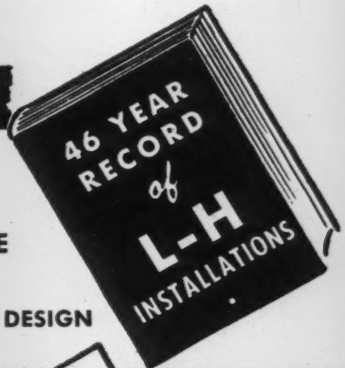
When the honeymoon is over . . . grim reality takes the place of pleasant dreams. Right now, the air is full of romantic possibilities in the field of oil heating equipment for post-war. Don't get "hitched" in a hurry. When the time is right—talk to QUIET MAY!



The proven and dependable Dual Utility Oil Heating Unit will be included in the line when we resume production.

May Oil Burner Corporation
Baltimore-3, Md.

the **SOURCE** *of* PRE-TESTED PERFORMANCE *in* COOLING TOWER DESIGN



the **REASON**

"The proper coefficients for reducing (cooling tower) theory to practice are known by few . . . knowledge can be obtained only through long years of practice . . . observation of results produced by various installations . . . with varying atmospheric conditions . . . under different bases of efficiency."

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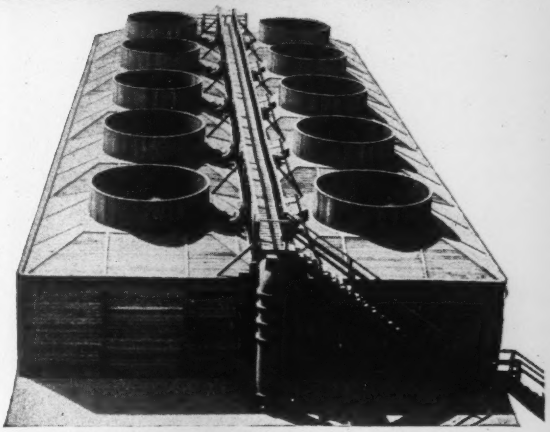

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• NEW BOOKS & REPORTS •

[Also see page 523, editorial section]

Comfort Air Conditioning

The basic data necessary for calculation of loa requirements for comfort air conditioning are given i part IV of the fourth edition of the engineering standards of the Heating, Piping & Air Conditioning Contractors National Association.

This 38 page pamphlet contains the definitions o terms used in discussing air conditioning and example showing the application of psychrometric relations, a well as the method of calculating the load for comfor air conditioning. Charts and tables give the necessary data on which these calculations are based. The pamphlet brings together in one place the material which the engineer needs for his work and presents it in a handy and easily used form.

Copies can be obtained from the Heating, Piping & Air Conditioning Contractors National Association, Room 1401, 1250 Sixth Ave., New York 20, N. Y., fo $1.00.

Aids to Technical Writing

Aids to Technical Writing, by Richard C. Jordan associate professor and assistant director, and Marion J. Edwards, research assistant, both of the Engineering Experiment Station at the University of Minnesota, is a practical and comprehensive discussion of the proper design of the format, the preparation of illustrations and drawings, use of accepted symbols and abbreviations, and the correct handling of bibliographies, numbers and equations, etc. These phases of technical writing accomplish the purpose best, the authors feel when they follow approved methods, and this bulletin aims to segregate and summarize the methods which lead to interesting and effective technical writing.

A valuable feature of the booklet is the inclusion of the various abbreviations for scientific and engineering terms, the letter symbols for hydraulics, mechanics of solid bodies, heat and thermodynamics (including heat flow), and graphical symbols for use on drawings in mechanical engineering. There is also an extensive table of conversion factors.

Among the subjects discussed are planning for the printer, style in non-letterpress publications, preparation of manuscripts for magazines, bibliography forms, footnotes, numbers, equations, tables, proofreader's marks, photography in technical publications, and the preparation of drawings for publication.

This 125 page bulletin may be obtained from the Engineering Experiment Station, University of Minnesota, Minneapolis, for 50c.

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Briefly Noted

American War Standard for Allowable Concentration of Methanol, Z37.14-1944, available from American Standards Association, 70 E. 45th St., New York 17, N. Y., for 20c per copy. This standard defines allowable concentration of methanol, which is widely used in industry as a solvent in the manufacture of plastics, varnishes, lacquers, textile soaps, and wood stains, and for many other solvent purposes, and as an antifreeze, a denaturant for ethyl alcohol, and an intermediate in the synthesis of other organic compounds.

American War Standard for Allowable Concentration of Styrene Monomer, Z37.15-1944, available from American Standards Association, 70 E. 45th St., New York 17, N. Y., for 20c. This standard defines the permissible concentration which may safely be permitted and also specifies the sampling procedure to follow in determining the concentration of this material, which is used in manufacture of plastics and synthetic rubber.

Cross Flow Cooling Tower Calculations, by N. P. Peet, paper No. 44-SA 29, presented at semi-annual meeting of the American Society of Mechanical Engineers, 29 W. 39th St., New York 18, N. Y., last June. Purpose of the paper is to present "what is believed to be a satisfactory approach to the problem of evaluating performance of cross flow towers."

Economic Thickness of Thermal Insulation for Intermittent Operation, by C. B. Bradley and C. E. Ernst of Johns-Manville, and V. Paschkis, Columbia University, paper No. 44-SA 14, presented at semi-annual meeting of the American Society of Mechanical Engineers, 29 W. 39th St., New York 18, N. Y., last June. Curves are presented permitting the determination of the economic thickness of insulation for intermittent operation, the curves being developed by means of the electrical analogy method.

Effect of High Relative Humidities in Producing Changes in Dimensions of Plastics, by A. C. Titus, General Electric Co., paper 44-SA 25, presented at semi-annual meeting of the American Society of Mechanical Engineers, 29 W. 39th St., New York 18, N. Y., last June. Dimensional changes due to moisture absorption in laminated plastic products are closely related to the type of filler employed. This paper describes experimental methods and results obtained.

Mineral Wool: Blankets, Blocks, Insulating Cement, and Pipe Insulation for Heated Industrial Equipment, commercial standard CS117-44 of the National Bureau of Standards, for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C., for 10c, and available on request from the Industrial Mineral Wool Institute, 441 Lexington Ave., New York 17, N. Y. This standard is designed to afford consumer protection through its material and installation specification requirements. There are tables for individual products giving thicknesses recommended to take care of operating temperatures up to 1600 F.

Load Calculation Procedure for Electric Panel Space Heating, by B. F. Raber and F. W. Hutchinson, of the University of California, technical paper 44-154, pre-

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sented at summer technical meeting of American Institute of Electrical Engineers, 33 W. 39th St., New York, N. Y., last June, and available from AIEE for 30c. The authors discuss electricity as a panel energy source, types of electric heating panels, and give an analogy between lighting and panel heating. Panel design procedure and heat balance are covered, and there is a numerical example. Panel performance characteristics are summarized.

Moisture Controlled Air in Metal Processing Using Lithium Chloride Air Treating Equipment, by Robert E. Wills, Surface Combustion Corp., paper No. 44-SA 2, presented at semi-annual meeting of the American Society of Mechanical Engineers, 29 W. 39th St., New York 18, N. Y., last June. This paper reviews some of the more common applications where positive control of moisture content of atmospheric air is required, including cupola dry blast, blast furnace dry blast, powdered metal processing, magnesium castings production, and ball bearing production.

Observations on the Use of Cyclohexylamine in Steam Heating Systems, by A. A. Berk, associate chemist, fuels and explosives service, Bureau of Mines, paper No. R. I. 3754, of the U. S. Department of the Interior, Bureau of Mines. Following a discussion of corrosion of piping in heating systems, the paper discusses alkalizing condensate with amines, properties and characteristics of cyclohexylamine, cyclohexylamine as an inhibitor of corrosion, distribution of cyclohexylamine in the heating system, and gives numerous tables of test data. It is concluded that corrosion of steam heating systems is due principally to carbon dioxide which acidifies the condensate, that one method of preventing corrosion is to introduce sufficient amine into the stream to neutralize the acidity, and that the treatment has been shown to be useful in steam systems where return line corrosion is a serious problem.

Some Characteristics of Rotary Pumps in Aviation Service, by R. J. S. Pigott, Gulf Research & Development Co., paper No. 44-SA-6, presented at semi-annual meeting of the American Society of Mechanical Engineers, 29 W. 39th St., New York 18, N. Y., last June. This paper is devoted to a discussion of characteristics of gear and vane type rotary pumps which make them widely adaptable to lubrication oil, fuel oil, supply and other aircraft uses in which they predominate.

Stabilizing a Suction Relief Valve, by Ed S. Smith, Bendix Aviation Corp., paper No. 44-SA 17, presented at semi-annual meeting of the American Society of Mechanical Engineers, 29 W. 39th St., New York 18, N. Y., last June. Starting with a less than fully stable conventional valve in aircraft use, a simple analysis is presented which is based upon energy considerations under resonance conditions and involves a minimum of mathematics. This analysis led to the disclosed improvement which renders the valve stable under all installations except the worst, from an acoustic standpoint. A short appendix on acoustic systems is included for the convenience of control engineers who may need in advance to evaluate and, if necessary, correct acoustic difficulties of installations.

Variable Heat Transfer Rate Correction, by Karl A. Gardner, Griscom-Russell Co., paper No. 44-SA 19, presented at semi-annual meeting of the American Society of Mechanical Engineers, 29 W. 39th St., New

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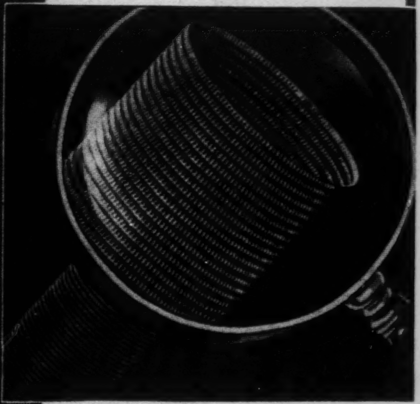

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DUX-SULATION
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York 18, N. Y., last June. The change in temperature of the fluid streams within a heat exchanger, through the consequent alteration of their physical properties, may cause the overall heat transfer coefficient to vary between rather wide limits; this represents the chief source of error in mean temperature difference formulas, most of which are derived on the assumption of constant overall coefficient. Colburn based a simple method of correcting for this effect in counter and parallel flow exchangers on the assumption of a linear variation of rate with fluid temperature. On this same basis, equations are developed in the present paper for multipass exchangers in which the shell fluid film controls. It is shown that the results are practically independent of the number of tube passes and the numerical data given are, therefore, those for the limiting case of cross flow with both fluids mixed, since this proves to be more amenable to direct mathematical treatment. These data are presented graphically and in tabular form as corrected factors by which the arithmetic average overall heat transfer coefficient and logarithmic mean temperature difference may be multiplied to obtain the true mean heat transfer coefficient-temperature difference product; an example of their use is given.

Vegetable and Fruit Dehydration

Vegetable and Fruit Dehydration—A Manual for Plant Operators (U.S. Department of Agriculture Miscellaneous Publication No. 540) was written with the stated objective "to serve as a manual for commercial operators." This objective has been capably fulfilled in 218 pages which are concerned with a broad general picture of the entire problem of operating a dehydration plant. The contents range from the problems of locating new plants and raw materials through descriptions of all the processes required to produce the dehydrated product to final packaging, storage, shipment, and reconstitution for use. The material has been well organized, and the objective has been adhered to. Some 28 tables summarize a variety of valuable operating information, such as floor space requirements in plant layouts, equipment costs and utility requirements, blanching and drying data, operating and labor costs, and rehydration data. Use of the volume would have been greatly facilitated if a subject index for easy reference had been included, or even only an index of tables.

After considering the locating of new plants, the publication discusses plant layout, storing and handling the raw materials, and the several preparatory processes such as washing, grading, peeling, trimming, cutting, blanching, and sulfuring. Twenty-nine pages are then devoted to a discussion of drying principles sufficient in scope for plant operators. This section is unencumbered with drying theory and masses of experimental data. The effect of drying conditions on the quality of the product is next discussed, followed by about 38 pages devoted to different types of dryers and their operation to methods of heating and temperature control, and to the movement of air by propeller type fans and centrifugal fans. The tunnel dryer and its various modifications are given the preponderance of consideration in the discussion of dehydrators. This

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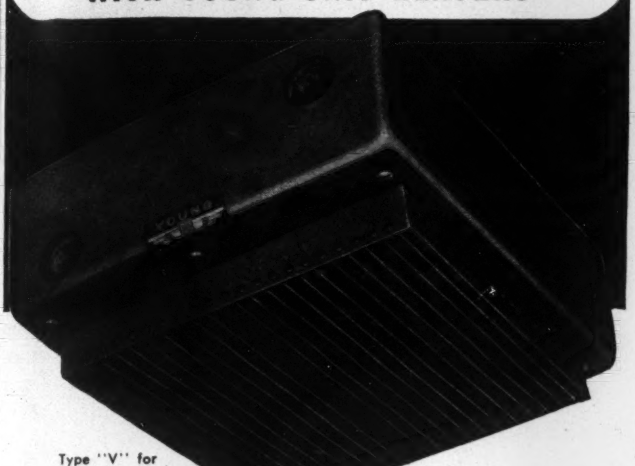

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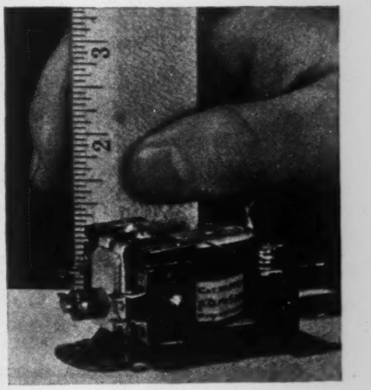

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section could have been enhanced with some specific operating data on a few large commercial installations. Likewise, discussion of the various other types of dryers could have been improved with illustrations of the equipment, as well as some general operating data on usual capacity range and efficiency, together with average operating costs and first costs to compare with the tunnel dryer. The volume is concluded with sections on packaging, inspection, types of packages and substitutes, packaging equipment and methods, sanitation, pest control, requirements of a control laboratory, rehydration tests, quality testing, processing costs, and specific instructions on handling various fruits and vegetables.

In one sense, the title of the publication is misleading in that a very large portion of the material refers primarily to vegetables, and likewise much of the drying and cost data are for vegetables. It is of interest to note that the range of total costs to produce a pound of any dehydrated vegetable is 13 to 70 cents, depending on raw material costs.

The volume does not contribute greatly to the needs of the design engineer, but this is not criticism since the objective was a manual for plant operators, not a manual of design data.

Several numerical examples on the calculation of properties of air-water vapor mixtures are given and involve the humidity chart in some cases. Two types of humidity charts are presented, designated as the per cent relative humidity and the absolute humidity charts. Two numerical examples on the application of the fan laws in analyzing changes in dryer operation are presented.

Seventy-six figures comprising graphs and photographs support the written descriptions.

Some of the important problems after dehydration are given a consideration not found elsewhere in the literature. Among these are the methods of rehydration, an operation of importance equal to dehydration, and methods of quality testing. Both problems are presented concisely, and the generally accepted methods are described.

This publication summarizes the present commercial methods in food dehydration operation, and as such is indispensable to operators of food dehydration equipment and to those embarking on a food dehydration project. In the latter respect, it is of interest to note that the publication makes no comment or prediction on the future of postwar food dehydration in the United States.

This book may be obtained from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C., for 30c.—W. R. MARSHALL, JR.

Graphical Solutions

Graphical Solutions, by Charles O. Mackey, professor of heat-power engineering, Cornell University, offers in concise form the fundamentals of a subject that is of interest to every engineer. At one time or another, the need for a clear, graphical presentation of involved data arises in almost everyone's work. Those who only occasionally need a quick reference to the various methods of handling graphical solutions will find this book a mine of information.

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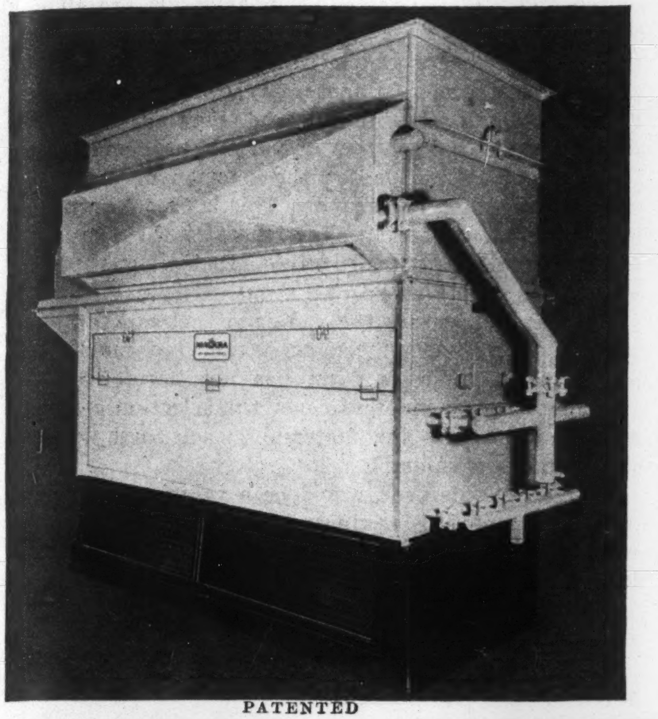

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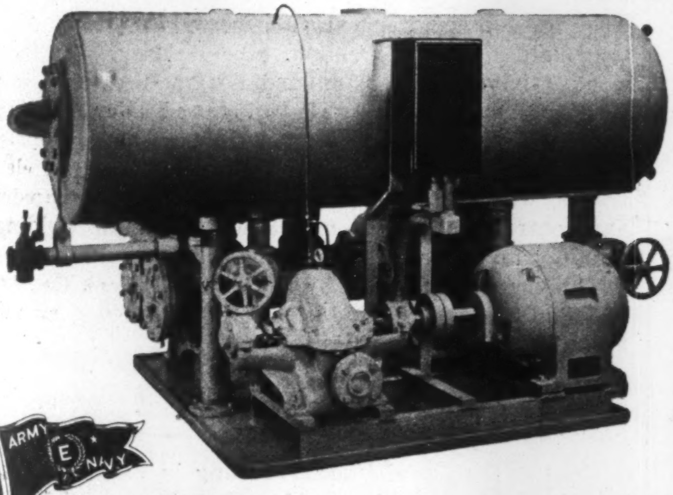

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Chapter 3 discusses the design of network or interception charts, a subject on which too much clear information in simple form has not heretofore been available. Other chapters cover the selection of empirical equations and the material is set forth in clear and readable fashion.

Altogether this book would be a valuable addition to the library of any engineer who from time to time encounters the need of presenting graphical solutions of special problems. The publisher is John Wiley & Sons, Inc., 440 Fourth Ave., New York, N. Y., and the price is $2.50.—W. G.

Arc and Acetylene Welding

Arc and Acetylene Welding, by Harry Kerwin, formerly of the California Polytechnic School, is a nontechnical book for the beginning student, or for the instructor or engineer who understands the technical but not the practical side of welding. Designed for use in a trade or vocational class, much emphasis is placed upon technique. The author stresses in his preface that the student must remember that all welds must be 110 per cent strong. The weld must be stronger than the parent metal, he says, and if a weld breaks the welder is at fault.

Part 1 on acetylene welding has chapters on the weld, welding equipment, preparation for welding, basic practice plates, aircraft welding, pipe welding, identification of metals, expansion and contraction, cast iron welding and cutting, hard facing and alloy welding, and brazing. Chapters on arc welding, which comprise part 2, include the welding machine and its care, electrodes, wearing apparel, beading technique, expansion and contraction, cast iron welding, aluminum welding, building up and hard facing, and testing weld samples.

This book is published by McGraw-Hill Book Co., 330 W. 42nd St., New York 18, N. Y. It has 240+ xii pp., 5⅛ x 7¾ in., and its price is $2.50.

Friction Heads of Water in Pipe; Effect of Pipe Roughness

Friction Heads of Water Flowing in Six Inch Pipe and the Effects of Pipe Surface Roughness and Water Temperatures on Friction Heads is the title of bulletin No. 77 of the Agricultural and Mechanical College of Texas, College Station, Texas. The authors are F. E. Giesecke, professor emeritus, and J. S. Hopper, assistant to the dean of engineering.

Part 1 of this 49 page bulletin is introductory, and gives credit to a number of firms which cooperated in financing the investigation. Part 2 is a summary of a more extended report of the investigation published in the Transactions of the American Society of Heating and Ventilating Engineers, vol. 47, pp. 71-92. It shows that the friction in a standard 6 in. black pipe varies as the 1.78 power of the velocity of the water when the temperature of the water is 95 F. It also shows that for a velocity of 5 ft per sec, the friction head in a standard 90 deg "no-length" screwed elbow is equal to the friction head in 15 ft of pipe and that the friction head in a 90 deg "no-length" welded elbow is equal to the friction head in 6 ft of pipe. The concept "no-length" elbow is introduced to facilitate accurate calculations of friction heads in pipe lines. In calculating such friction heads it is convenient to measure the length of straight pipe from center to center of elbows. In that case a greater length of straight pipe is used in the calculation than actually exists; the resulting error may be corrected by deducting from the friction head in the elbow the friction head in a pipe whose length is twice the distance from the end of the pipe—in the elbow—to the point of intersection of the axes of the two pipes connected by the elbow. The remainder is the friction head in a "no-length" elbow.

Part 3 treats of the friction heads in copper, brass, and other hydraulically "smooth" pipe. Two formulas are developed by means of which the friction heads in such pipes may be calculated for any pipe diameter, any water velocity, and any water temperature. To facilitate calculations, a table of kinematic viscosities, in English units, is presented. The two formulas are based on the experimental determinations of friction heads in 4 in. and smaller brass pipe by J. R. Freeman

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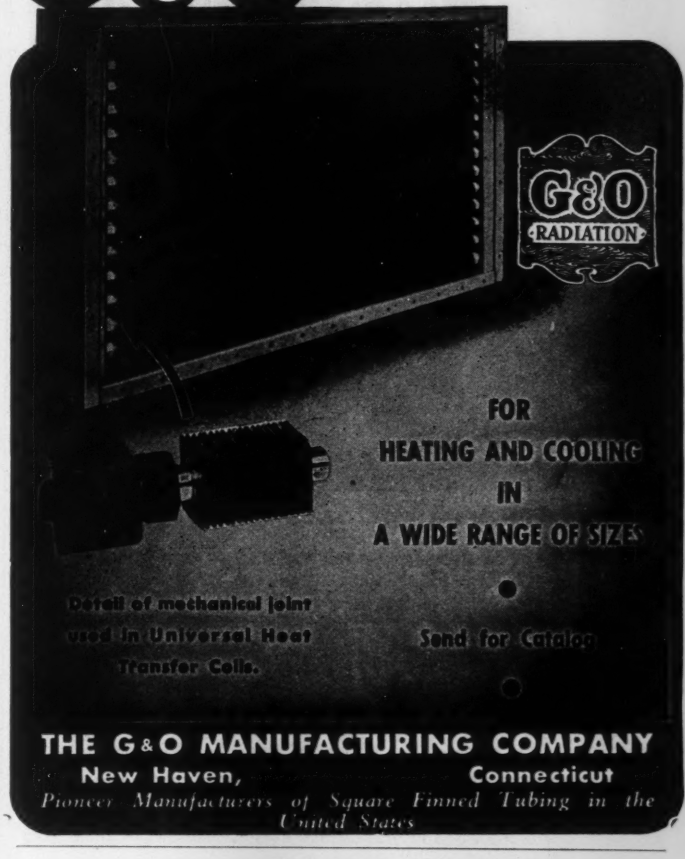

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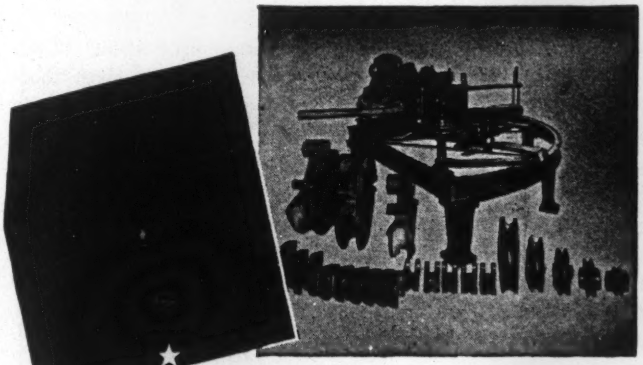

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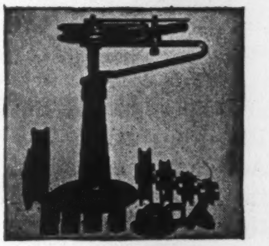

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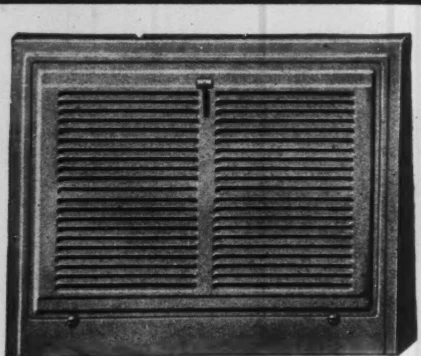

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and published in Flow of Water in Pipes and Pipe Fittings, as well as on data secured from other classic publications.

Part 4 treats of the effect of pipe surface roughness on friction heads and presents two interesting and instructive photographs; one, of a 1 in. iron pipe which had been in use for 50 years as a service pipe for domestic water and which had corroded so that its friction head was 25 times as large as the friction head in a new and clean pipe of the same size; the other, of a 20 in. cast iron pipe which had been in use about two years to discharge salt water from an oil well and which had incrusted so that its internal diameter had decreased to about 8 in. and its friction head increased to about 40 times its original value. The effect of pipe surface roughness is discussed in detail, the discussion being based largely on the experimental work of Dr. Nikuradse.

Part 5 treats of the effect of water temperature on friction heads in steel, iron, and other hydraulically "rough" pipe. A chart is presented by means of which the approximate friction head may be determined for a hydraulically "rough" pipe of any diameter and for water of any velocity and of any temperature, but the chart is intended to be used primarily to determine the change in the friction head resulting from a change in the temperature of the water when the velocity of the water and the pipe size remain the same.

Part 6 compares the friction heads secured by experiment at the Agricultural and Mechanical College of Texas in 1940 for 6 in. standard black pipe with those secured experimentally by John R. Freeman in New Hampshire in 1892, and published in 1941 by the American Society of Mechanical Engineers. In general, the friction heads found by Mr. Freeman are about 13 per cent higher for a velocity of 4 ft per sec than those found in Texas; this difference decreases as the velocity decreases. About one-fourth of this difference may be ascribed to differences in pipe diameter and in water temperature; the remaining three-fourths may be the result of a difference in pipe surface roughness, which is discussed in detail in the bulletin, and it seems that the results of the two investigations, made at different times, by different persons, and in different localities, agree as well as could reasonably be expected.

Welding and Cutting Safety Standards

It is well known that the welding and cutting industry, ever since its inception, has stressed safety. Further evidence of this alertness in the safety field is shown by the publication of a 32-page booklet on Safety in Electric and Gas Welding and Cutting Operations.

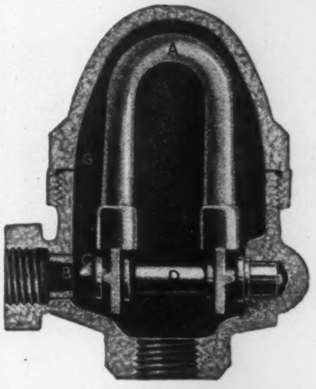
This is another in the series of American War Standards developed by the American Standards Association. Its preparation was initiated by the International Acetylene Association, the American Welding Society, the National Electrical Manufacturers Association, and the Division of Labor Standards of the U. S. Department of Labor. The booklet is designed to serve as a guide for the protection of the individual operator from injury or illness, and for the protection of property from fire or other damage arising out of improper methods in the installation, operation, or maintenance of welding and cutting equipment. It covers every phase of safety applicable to all ordinary welding, cutting, brazing, lead burning, and flame-treating operations. It does not attempt to cover any special hazards which may be inherent in the operation of special industries such as explosives manufacturing or shell-loading.

Copies may be ordered from the American Standards Association, 70 E. 45th St., New York 17, N. Y., for 40c.

Principles of Powder Metallugry

Back of the established and routine processes of what is already almost a standardized industry, is the underlying theory that had to be developed before powder metallurgy could pass from a concept to a technological art. The author of Principles of Powder Metallurgy, Franz Skaupy, has presented a very brief resume of the fundamental science that came before. Apparently much of the investigational work in powder metallurgy was done in Europe, for many foreign journal articles are cited, mostly German, beginning about 1915. This short monograph is a concise study of the theoretical aspects of the subject. It will no doubt be enjoyable reading to anyone connected with this industry who desires to strengthen his practice with a review of some theory.

This book, which was translated from the German by Marion Lee Taylor, has 80 pages, 6x9 in., and 15 illustrations. It is published by the Philosophical Library, 15 E. 40th St., New York 16, N. Y. Its price is $3.00.—*K. S.*



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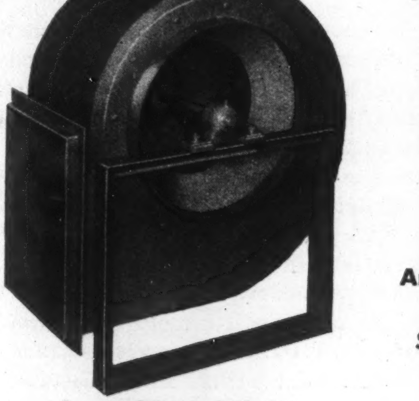

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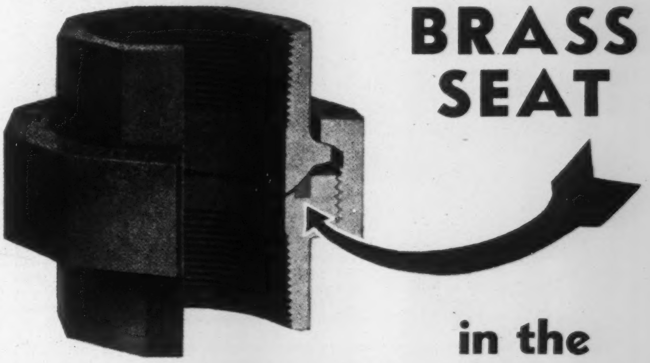

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Practical Metallurgy for Engineers

This very useful book (by the research staff of E. F. Houghton & Co.) is a comprehensive treatment of a broad subject in terms and language suited to the needs of the many workers in industry who have occasion to utilize the methods of metallurgy. The opening chapters cover the fundamentals prerequisite to an understanding of the subject—physics and chemistry, fuels and refractories, metals and their ores. After a short discussion of nonferrous metals and the manufacture of iron and steel, the book enters into a detailed consideration of the metallography and heat treatment of steel. There are chapters on mechanical treatment, grain size and hardenability, furnaces and salt baths, carburizing, and the other topics that are related to the technology of steel and its properties. Considerable attention is paid to temperature measurement and its control, and to plant operations in general.

Throughout, the text is thoroughly practical and avoids complicated scientific discussion. As the book's foreword states, it is a contribution to metal workers and engineers of the cumulative knowledge of metallurgy gained in 78 years of consultation and trouble shooting.

The book has 479 pages, $5\frac{1}{2}$x$8\frac{1}{2}$ in., with 26 chapters, 160 illustrations, numerous tables, and an appendix of reference data. It is published by E. F. Houghton & Co., 303 W. Lehigh Ave., Philadelphia 33, Pa., and costs $3.00.—*K. S.*

Standard on Industrial Control

Information contained in two important standards of the electrical industry has been correlated with the completion of a revised edition of the American Standard for Industrial Control Equipment, now C19.1-1943, AIEE No. 15-1944. The revision, which was prepared by a sectional committee under the joint sponsorship of the American Institute of Electrical Engineers and the National Electrical Manufacturers Association, consisted largely in correlating pertinent information in the old AIEE Standard No. 15 (American Standard C19-1928) and the new NEMA Industrial Control Standards published in 1937.

The new American Standard is a reference work of practical information concerning the manufacture, test, and performance of industrial control equipment. Representing, as it does, standardized practice in the United States, it assists in harmonizing practices in the industry, promotes production economies, and consequently benefits users of electric motors and control equipment. It covers industrial motor control, similar control used for industrial heating, and rheostats, including those for the generator field. The control apparatus conforming to the standard must be suitable for carrying its rated load when and where the temperature of the cooling medium does not exceed 40 C, and where the altitude does not exceed 6000 ft. For operation in altitudes above 6000 ft and not exceeding 15,000 ft, provision is made for derating the apparatus. Sections in the standard cover resistors, ratings, specifications for products, and performance.—From an article by William Seubert, chairman of the sectional committee on industrial control apparatus, in Industrial Standardization.

The Weather As Destiny

Heating and air conditioning engineers are closely concerned with atmospheric conditions indoors and out; the studies of Dr. William F. Petersen—and others—on the effects of weather on man are therefore not only of direct interest but of practical value as well. Dr. Petersen's latest book is titled Lincoln-Douglas: The Weather as Destiny, and is published by Chas. C. Thomas, 220 E. Monroe St., Springfield, Ill. (211+x pp., 5¾ x 8¾ in., $3.00). Because of the scope of the subject and the varying viewpoints about Dr. Petersen's conclusions, we present here not one but three reviews of this book—the first by a doctor and professor of experimental medicine, the second by a consulting and advisory engineer with a wide experience and interest in all phases of air conditioning, and the third by an engineer and self-described "skeptic about anything." Dr. Petersen will be remembered by many of HPAC's readers as the author of an article on What Weather Does to Man, in our September 1938 issue.—The Editor.

Reviewed by Clarence A. Mills
Professor of Experimental Medicine
University of Cincinnati

In this delightful fantasy, the author makes a brief but complete presentation of his philosophy of weather dominance over man. Using Lincoln and Douglas as convenient pegs upon which to hang his philosophic dissertations, he proceeds to show how various phases of weather behavior might have influenced their actions and decisions at critical periods in their lives.

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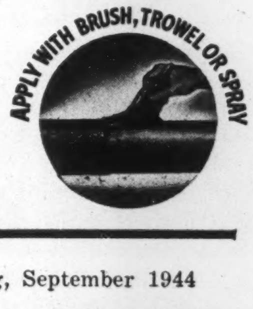

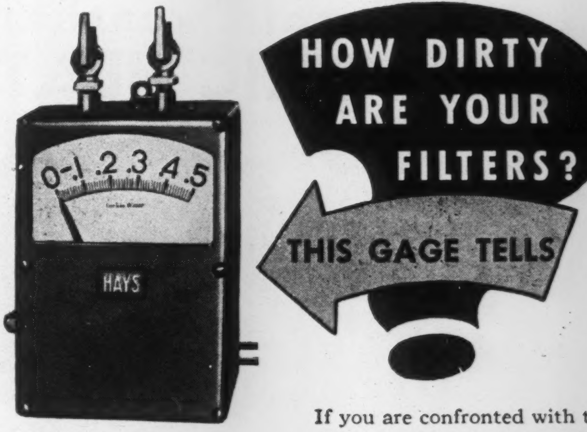

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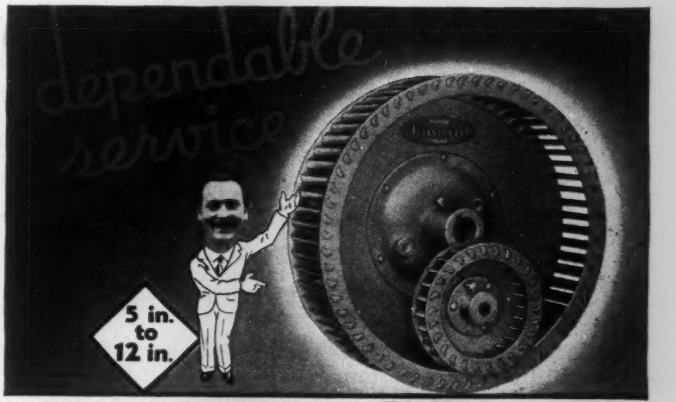

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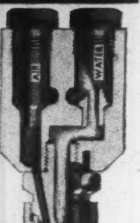

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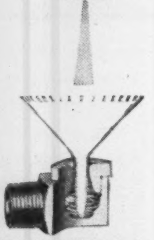

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As in most of his other writings, the author lays great stress on the broad and slender body types and their contrasting reactions to weather change. Lincoln was his ideal example of the slender, hyper-reactive individual, moody and extremely sensitive to weather effects. Douglas—on the other hand—served as his broad, rotund, cheerful extrovert, little affected by such environmental factors.

One is never certain, in reading the book, just how far the author means to go in applying his weather philosophy to the life of a given person. While all his explanations of Lincoln's reactions *may* be true, the likelihood of such actually being the case is extremely slight. Petersen has received much criticism in past years for this tendency to stress striking instances of such *apparent* cause and effect relationship, since he overlooks the untold times when similar weather situations bring no such results. The writer of this review was enticed into a similar graphic study of weather effects in certain disease attacks (acute appendicitis, epilepsy, suicides), but the failure of visually *apparent* relationships to show statistical significance with unbiased mathematical handling soon led to abandonment of this method of approach. Even though proper statistical methods should show that certain weather phases are significantly related to certain types of human reactions, one must still keep in mind that this relationship will probably fail to hold in a large percentage of instances. Thus, one can only say that weather *may* be a factor in a given case, even when the association seems most apparent.

If the reader keeps these facts in mind as he peruses this book—just as the author must surely have done during its preparation—then he should enjoy what is here termed a scientific fantasy. While the sentence structure is often cumbersome, the paragraphing rather whimsical, and the price high for so small a book, it will probably have a wide circulation. People today are deeply interested in outside forces affecting human affairs. They should look upon this word-picture by Petersen as his final conception of weather effects, drawn after long years of study. Lincoln and Douglas were only convenient dummy-forms around which he draped the mantle of meteorological influence as he saw it.

Reviewed by Walter L. Fleisher
Consulting and Advisory Engineer

So many books have been written lately in an attempt to place the responsibilities for our actions on some cosmic disturbance that one approaches Dr. Petersen's book with a slight amount of skepticism. As a brief summary of the moods and actions of a great man—his weaknesses, his accomplishments, his rise at critical times above the embarrassments and harasses of his domestic and political life—it is a pleasant monograph. The sidelights on Stephen Douglas and the insight into Mary Todd's character make enjoyable reading. We today, however, who feel that psychoanalysis could have overcome many of the difficulties that confronted Lincoln and his wife—because to me Douglas, except as an opponent or backdrop to the picture, seems to have no real bearing on the subject—doubt whether Dr. Petersen would have had as much data or basis on which to pin his conclusions if the medical and psychic advances that we have since witnessed had been available at the time of Lincoln.

We of the heating and air conditioning profession might like to believe that sudden changes in the barometer pressure, and the consequent heat or cold or fluctuations that accompanied such changes, could so affect the lives of the people that we would stand above all other professions as the "witch doctors" of our age. Because one or two prominent people at some particular time were born with mental or physical deficiencies would hardly justify the assumption that the weather was responsible, unless we made a statistical investigation of births and deaths and found that the same thing had happened to a very great percentage of those who were born under the same cosmic influences, without any of the disabilities that in isolated cases Dr. Petersen can cite.

Dr. Petersen is a devoted disciple of Hippocrates, who was one of the great observers of world history, a chronic traveler, and a man himself so susceptible to the dominant influence of the weather that even the effeminacy of the Scythians was attributed to it. Actually, Hippocrates is most famous today for the Hippocratic oath which (according to Philip Wylie's book, Generation of Vipers) "contains the promise that the doctor will do his best for the patient—outside of that it is sordid claptrap, the kind of thing one would expect lodge brothers to swear to, which promises that doctors will help other doctors at all times, pass the art along in the fraternity, perform no abortions, seduce no pa-

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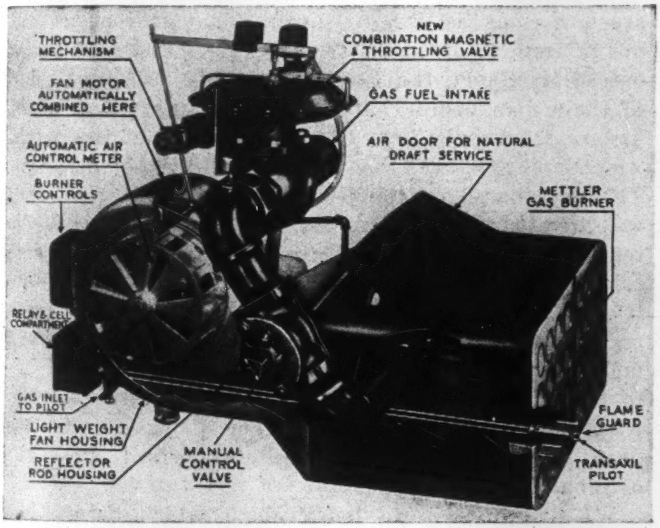
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tients, and keep mum about what, these days, needs more airing."

My main criticism of Dr. Petersen's assumptions is that the weather didn't start with Hippocrates nor will it end with our generation. Over millions of years or hundreds of millions of years the weather has been just as it is now, and instead of presenting dissimilarities it has presented a constant front as far as barometric pressures go that are so astonishingly alike that we all have in common the most important physiological attribute of human beings, be we Lincoln or Douglas or Mary Todd—a blood temperature of 98.6 F. We can change that only by raising our environment artificially to a point above an energy level ordinarily not prevailing on the globe. Psychically we vary greatly, physically be we leptosome or pyknic,* we still retain in health a temperature of 98.6 F.

Dr. Stefansson, the great Arctic traveler and anthropologist, states: "It is doubtful whether there has been any biological adaptation of man to his northward movement from the tropics or subtropics; at any rate, it seems clear that the eskimos, most northerly people in the new world, get their faces frozen as easily, shiver as often, and make all similar responses to chill as readily as whites, negroes, or south sea islanders.

"Man's ability to spread northward is, then, either wholly or chiefly cultural and depends mainly on clothes, housing, and the use of fire. . . .

"We fear the unknown north—and with good reason, for conditions which knowledge and skill might turn to our advantage prove hostile and even deadly when we lack the mental and physical equipment needed to meet them. . . .

"The fear of the north which pervades Mediterranean culture is not based merely on such commonsense reasons as I have given. That Europeans did not attempt to cross the tropics during the 1500 years preceding Henry the Navigator (1394-1460) was due to their firm belief that neither man nor plant could endure the terrific heat of a middle zone of the earth, which was too near the sun or too directly below it. This was based on the Greek doctrine that the earth was divided into five zones, only two of which—the temperate zones—were habitable. Since Henry's time colonization of the tropics has been retarded by a survival of the old belief in a modified form—that although tropics were livable, they were so hot as to be very uncomfortable for Europeans, as well as demoralizing to them, mentally and physically. . . . More recently, with the Arctic, as with the tropics, development has been hindered by residual beliefs derived from the original Greek doctrine."

We live in a world today about which nature has spread a blanket under which we survivors can exist and survive no matter what part of this blanket we may be covered by. In other words, our bodies are developed to withstand the maximum conditions that exist in the world. Our scientific knowledge has taught us to compensate for minima. Food and vitamins and specifics have or can correct our deficiencies. Fortunately, we do not have to contend, except in isolated enclosures, against any energy requirements that are above the energy developed by our physiological make-

---

*Pyknic type of individual is characterized by short, squat stature; leptosome type is tall and thin.

Illustration shows 2" x 2" x 1/8" bulb angle being bent to 70 degrees the hard way without checking or deformation.

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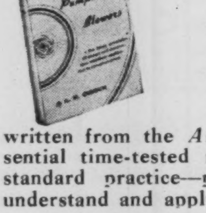

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up. We are what we are because we still exist. If we had been other than we are, we would no longer be the survival that we represent.

Reviewed by V. L. Sherman

"Is it as plainly in our living shown,
By slant and twist, which way the wind had blown?"

That, I take it, is the question—and a very old one, too. The present writer is tempted to parade the old proverbs and sayings connecting year 'round weather with the lives of man and beast, and (most important) crops. Our old friend Robert Boyle, of Boyle's Law fame, experimented with seed germination at various atmospheric pressures. That must have been before 1667, when the Physicists of Florence was printed. And with newborn kittens, an item that must have come to Edgar Allen Poe's attention, for he includes a similar incident in yarns about aeronautics. That was before 1840. As for the influence of weather:

> "A green Yule and a white Pasch (Easter) make a fat churchyard."
>
> "But certain winds will make men's temper bad."
>
> "I am mad but north northwest—when the south wind blows I know a hawk from a handsaw."

(I see Dr. Petersen is ahead of me on that one.)

Let us go back to one of the most interesting writers, Burton, in his Anatomy of Melancholy.

—"the air works on all men more or less, but especially such as are melancholy, or inclined to it, as Lemnius holds; they are most moved with it, and those which are already mad rave downright, either in or against a tempest."

Now we will go relatively modern, consulting Paul Bert's Barometric Pressure, published in 1878, and

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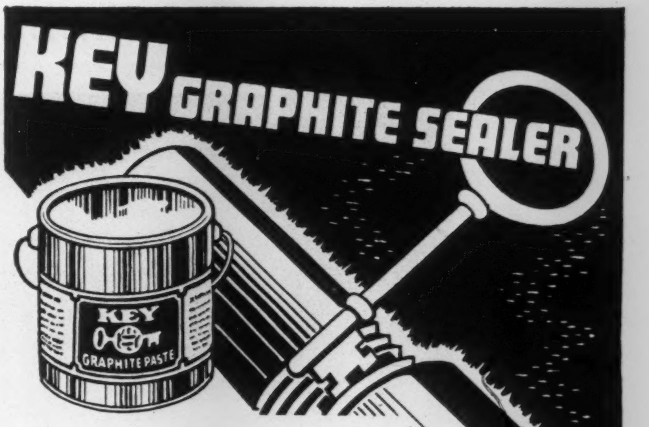

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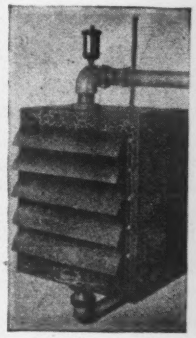

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recently translated in connection with the study of aviation medicine. Bert was very skeptical when it came to the effects of slight barometric changes on invalids, but in the preface he has this to say about his best friend: "M. Jourdanet properly reserved for himself the study of the effects produced by slight variations in barometric pressure, acting either for a rather brief time upon invalids—a test the exquisite delicacy of which will always terrify experimenters a little—or for years upon the same individuals, or for centuries upon successive generations, joining their effect to those of so many causes known or unknown; dangerous problems, but very likely to fascinate a wise and eager spirit, aided by an eloquent pen."

Whether or not the study of Lincoln, his wife, and Stephen A. Douglas is undertaken because of their physical contrasts, it is certain that a study of their individual lives cannot be well handled separately. Destiny threw them together. The author says in the preface, "I shall endeavor to make evident certain of the simpler mechanisms which are involved in what is loosely termed 'destiny,' knowing full well that in the tangled skein of fate the individual strands are so numerous that the final pattern can never be quite unravelled."

I like that. A study of the influences is much more to the point than the opinions of their biographers. The statue of Lincoln was not placed before Westminster Abbey because so many biographies were written about him. Mary Todd Lincoln was always shabbily treated by biographers until Dr. W. A. Evans put his hand and mind to the pen, in Mrs. Abraham Lincoln. Douglas, the Yankee Democrat, was always the villain who deferentially held Lincoln's hat at the inaugural. How were their lives influenced? To me that makes interesting reading.

I will admit to a real prejudice regarding this book. With a goodly number of other youngsters I grew up in a small town on the Illinois River, not so far north of the Lincoln country. Many of the families had been in the neighborhood since the 40's, and Lincoln lore didn't come out of the biographies. Ten minutes walk from the center of town could wipe out all evidence of human endeavor, and that just suits boys. Most of the mothers were patient partners; we roamed as we pleased. Being in the "storm track" we had "weather" the year 'round. We grew up with it and in it, knew the signs, wind, sky, feel of the air. Barometers and thermometers were out of our ken.

But, using that sort of subconscious knowledge of life and weather of earlier days, much time, annoyance, and cash had been saved to me before reading anything of Dr. Petersen's. My experience was first-hand, day in and day out. We like the "storm track" as a climate, and have learned to live comfortably in it. We mark Door County, Wisconsin, as among the best of all locations, and it is hard to beat that for "weather."

There are, however, some annoyances to our friends about this time of year. The family doctor, with a tendency to asthma, wishes that so many of his patients with the same tendency didn't react to equinoctial squalls at exactly the same time he does.

• EQUIPMENT DEVELOPMENTS •

For your convenience in obtaining more information about any of this equipment, see coupon on this page. Add the new products and companies listed here to your Directory Section which you received in your January 1944 Heating, Piping & Air Conditioning and thus keep your records of sources of supply up to date throughout the year. Single asterisk indicates equipment not listed in Directory Section; double asterisk equipment and manufacturer not listed.

Future Application of Aircraft Heaters to Space Heating

No. 2697—Tiny aircraft heaters with a whale of a Btu output have so fascinated the millions of people who read of this remarkable wartime development that not a few have incorporated the heaters in their dreams of postwar space heating. This streamlined postwar planning is done simply by reducing the aircraft heaters in the imagination from bomber size to room size and suspending the imaginary units in a few rooms to provide the complete heating system of tomorrow.

The dream is a pleasant one, but Surface Combustion, 2375 Dorr St., Toledo, Ohio, maker of the "Janitrol" aircraft heater, shatters it with an explanation of why aircraft heating is impractical in its present form for such application.

A unit weighing 6 lb provides 15,000 Btu per hr. A comparison with a conventional furnace shows that a modern and compact forced air furnace, delivering 90,000 Btu per hr, weighs approximately 500 lb and occupies 53¾ cu ft of space, while an aircraft heater delivering 100,000 Btu weighs but 28 lb and is ⅔ cu ft in size. The aircraft units operate on liquid fuel for the reason that they were designed to use the same fuel that powers the airplane's engines.

Attractive as the aircraft heaters' postwar possibilities appear, Surface Combustion, a manufacturer of gas fired heating equipment for over 35 years, does not contemplate applying its units to general building heating in the immediate postwar period. It may take months or years to modify, test and make practical for incorporation in building heating units some of the principles of design used in aircraft heaters.

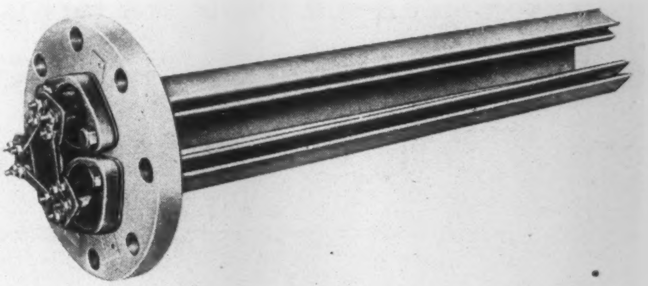
Aircraft heating is distinct from building heating, the company points out. A tremendous volume of air travels over the heating surfaces of the aircraft unit at mile-a-minute velocities which wipe away the heat much faster than would happen in building applications. The noise of this rapid air movement is not objectionable in an airplane, but is hardly the thing for most buildings. Temperature of the air from these heaters may be as high as 250 to 350 F, as compared to 150 to 200 F in a building. Again, 1000 hr operating life is ample for military airplane purposes. "Janitrol" aircraft heaters last considerably longer than that, but building owners think of heating equipment in terms of years, not hours.

There is no question but that the aircraft heater principle can be immediately adapted for some heating purposes on the ground, according to Surface Combustion. In fact, the company is making a portable unit for preheating of airplanes at arctic bases, cold weather construction projects and thawing out trucks frozen in mud. The portable unit has many postwar uses by utility companies for heating of manholes and providing spot heating of warehouses and loading docks. However, changes to make the unit suitable for a stationary residential furnace might reduce down to producing a unit similar in design, weight and appearance to present furnaces, as successful heating appliances depend on designing them for the particular field under consideration, the manufacturer says.

Postwar plans of the company call for improving its existing line of equipment and the bringing out of new designs as soon as proper and sufficient field experience and testing justify these new designs for consumer use. Extremely interesting experiences in the use of new alloy metals have been gained in the aircraft heater work, company engineers say. They also report that new methods of transferring heat from the fuel to the air stream and of building automatic ignition systems are among the many valuable things learned in making aircraft units. Much has been learned about the movement of air under higher pressures and velocities than normally used in heating. New types of blowers have postwar possibilities. This information and "know how" is being applied to improving postwar gas heating products, the company declares.

Electric Immersion Heaters

No. 2698—A new "Chromalox" immersion heater makes possible replacement of inexpensive, individual heating units easily and quickly, and by its unique construction, maintenance and repair have been greatly simplified, says the manufacturer.



The heater consists of a specially designed 5 in. flange in which are bolted three flange type, double bladed immersion heaters, each a complete heating unit

Heating, Piping & Air Conditioning, [10-44]
6 N. Michigan Ave., Chicago 2, Ill.

Please ask the manufacturers to send me more information about the equipment mentioned under the following reference numbers in Equipment Developments and Recent Trade Literature.

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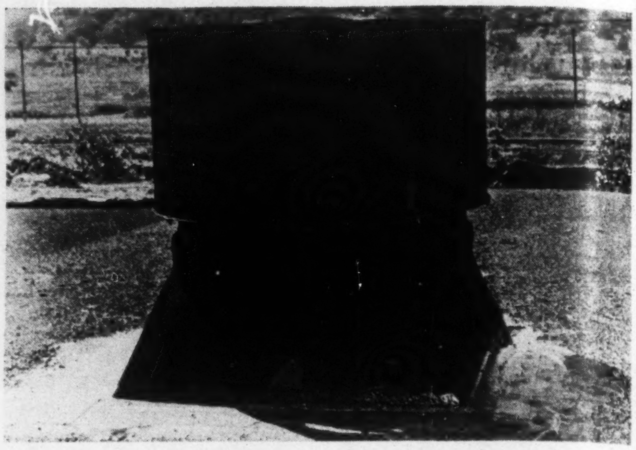
and each provided with an individual gasket. A terminal cover protects electrical connections. By using a dummy forged steel flange, to seal the opening while replacement of any one unit is being made, the other two immersion heaters are left in operation without interrupting service. This eliminates costly delays.

These heaters are supplied with suitable gaskets for mounting on a standard 5 in. pipe flange supplied by the user. Water immersion heaters are rated 6 to 18 kw and oil immersion heaters from 6 to 15 kw. Available for 115 or 460 volt, single or three phase service.—Edwin L. Wiegand Co., 7610 Thomas Blvd., Pittsburgh 8, Pa.

Power Ventilators for Foundries

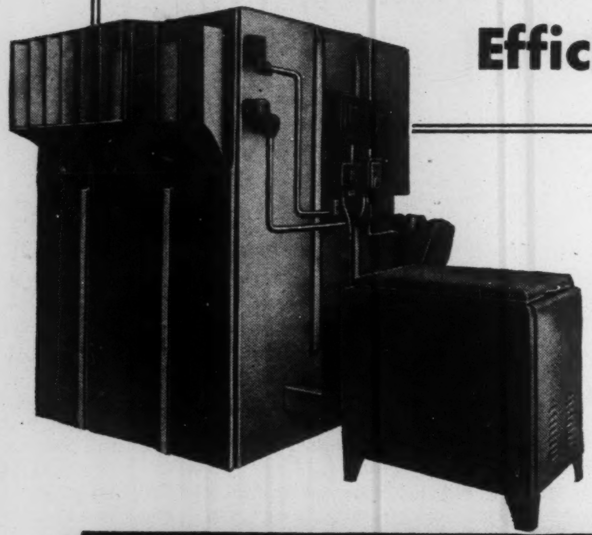
No. 2699**—Twenty-four "Iron Lung" power ventilators, each capable of removing from 30,000 to 45,000 cfm of air, are used to clear smoke and fumes in five nonferrous metal foundries operated by the Eclipse-Pioneer Div. of Bendix Aviation Corp. Job simplification to eliminate many manual operations and installation of safety equipment, including such ventilation devices as these, have been important factors in enabling the corporation's foundries to boost production of magnesium and aluminum castings, it is stated.

The ventilators are designed to discharge "devitalized air," heat, fumes, and smoke so high above the roof that it will be impossible for impure air to re-enter via open doors, windows, or idle ventilators. It is possible during a rain or snowstorm to look straight up through the ventilator's unobstructed throat and see fumes being sucked upward, without getting wet, says the manufacturer. The device is leakproof; when its fan is functioning and its dampers are open, downpours of rain or snow are shunted aside by the force of the discharged air stream. Operating motors are designed to fit individual plant or foundry atmospheric conditions. —Powermatic Ventilator Co., 4019 Prospect Ave., Cleveland 3, Ohio.



Long Bent Corrugated Flexible Connectors

No. 2700—Large diameter flexible corrugated stainless steel tubing is now being manufactured in long bent lengths. Pictured are two 16 in. diameter by 9 ft diesel exhaust connectors bent to 110 deg for an important war use. Extensively used on diesel engine exhaust and high temperature vapor lines, these connectors have inherent advantages of value to the chem-



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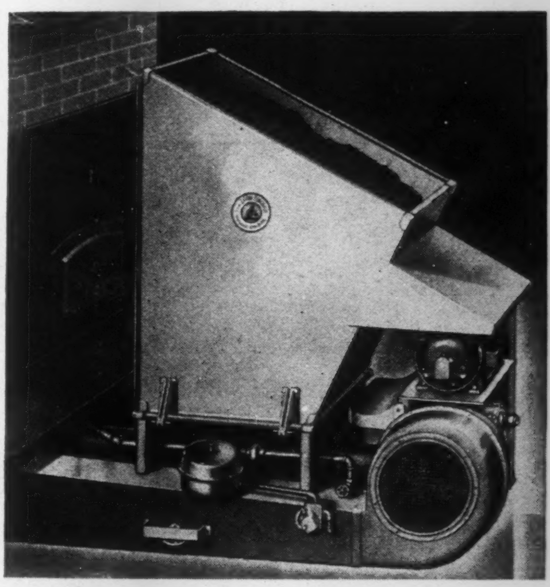
The seven-year performance record of the above Iron Fireman stoker in the Heinz plant includes: holding plant temperature uniform, regardless of weather; burning money-saving sizes and grades of coal; and operating with minimum labor costs. Further, Iron Fireman has helped maintain the spotless condition of the Heinz plant, indoors and outdoors, and has prevented smoke nuisance. Will you give us a chance to study *your* plant at *our* risk?

Our nationwide organization of qualified factory representatives and dealers is at your service. For a free survey showing what Iron Fireman firing can do in your building or plant, write Iron Fireman Manufacturing Company, 3083 W. 106th St., Cleveland 11, Ohio.



The Iron Fireman Poweram stoker (one of the many industrial models built by Iron Fireman), is designed for heavy continuous loads. It combines *worm feed* with *ram distribution* of coal. The worm conveys the coal to the retort in a loose, aerated condition; reciprocating blocks distribute it evenly and prevent packing.

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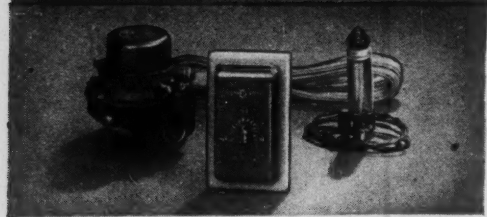

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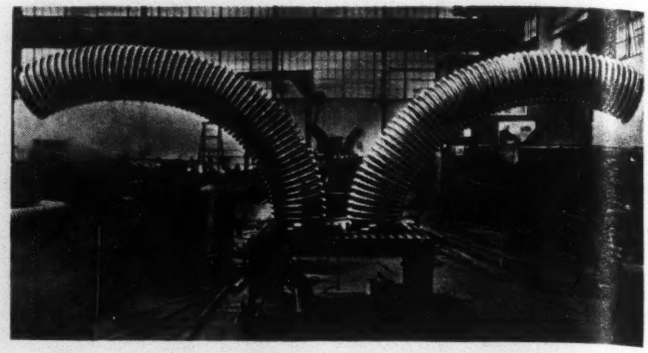


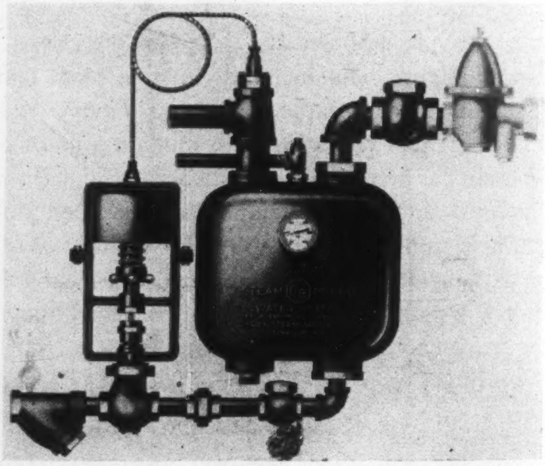
ical, power, and petroleum industries, says the manufacturer.

The connectors absorb expansion, contraction, and extreme deflection in all planes. Supplied in sizes 6 in. diameter and larger in carbon steel, any type of stainless steel and other corrosion resistant alloys, they require no packing and, having no seams, are permanently gas tight. The connectors handle corrosive liquids and gases under pressures up to 30 psi and at temperatures from subzero to 1800 F. Connectors for absorbing linear expansion only can be furnished for pressures up to 300 psi.—Zallea Brothers & Johnson, Taylor and Locust St., Wilmington 99, Del.

Steam Mixer Water Heater

No. 2701—The new steam mixer water heater illustrated is a complete packaged unit, including heater, temperature regulator, temperature and pressure relief valve, thermometer and, where necessary or desired, water pressure regulator and steam and water pressure gages, says the manufacturer. The unit is designed for steam pressures of 50 to 150 psi.

The heater can be installed near the point of use to deliver an adequate supply of hot water at controlled temperatures. Steam pipe sizes range from ½ to 1½ in., with capacities ranging up to 5500 gph. There is also a wide selection of temperature ranges available, making the unit practical as either a primary or booster heater.



While copper alloys remain on the critical list, the mixer body is being supplied in close grained iron. When conditions again permit, the body will be cast bronze similar to previous models which have been on the market since 1940.—O'Brien Steam Specialty Co., 205 Harrison St., Syracuse 2, N. Y.

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Whether it be in the controls of a secret Allied weapon, or in the heart of pre-war timing device, these tiny synchronous motors and time machines have proved their unfailing accuracy and reliability in millions of installations during the past quarter century.

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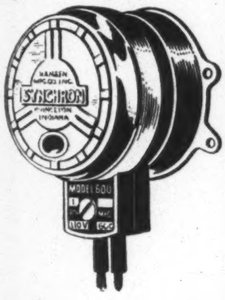

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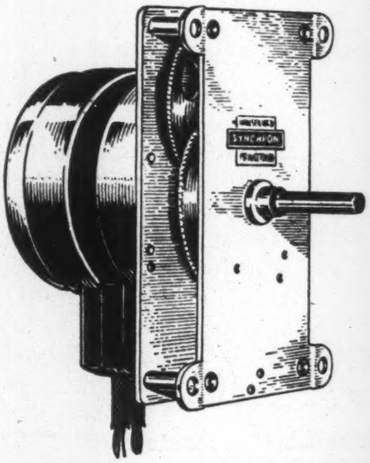

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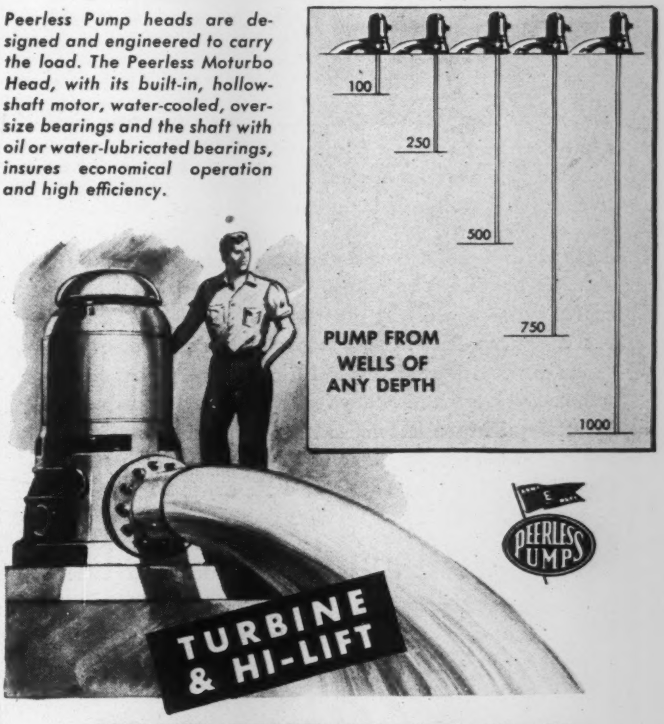

PEERLESS PUMPS

PEERLESS PUMP DIVISION
FOOD MACHINERY CORPORATION
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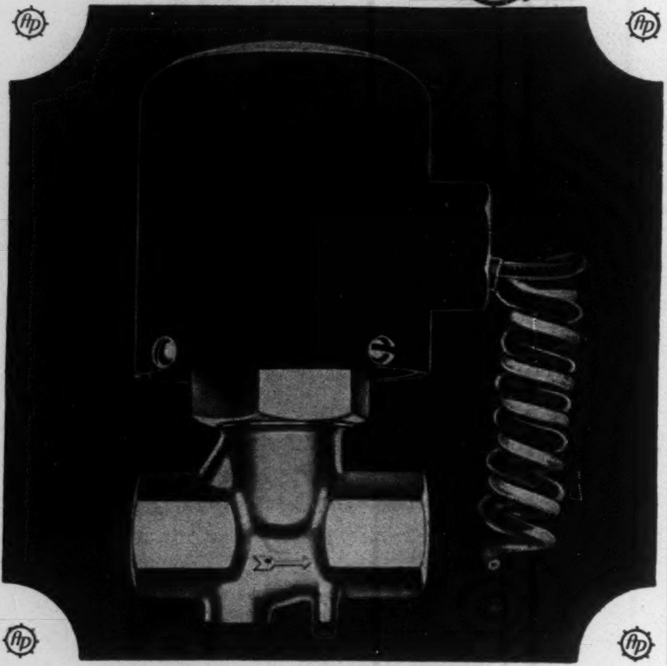
Dependability doesn't happen...

IT'S *BUILT INTO* EVERY AP VALVE



A-P MODEL 73-RJ
SOLENOID REFRIGERANT VALVE

This small, compact solenoid is popular with both manufacturers and service engineers alike, because of its unusual features in design, simple construction, positive, quiet, "trouble-free" operation, and easy inspection.

Adaptable to most commercial refrigeration and portable air conditioning applications, A-P Model 73-RJ is capable of operating at pressure differential of 180 lbs. p. s. i. "Wrap-Seal" coils, water and frost-proof, are "over-powered" for ample lifting power even during reduced voltage and heavy load periods. It can be easily and quickly disassembled for inspection and cleaning *without removing from the line.* Maximum capacity: Liquid line, 7.4 tons Freon at 6 lb. drop; Suction line, ½ ton Freon at 2 lbs.

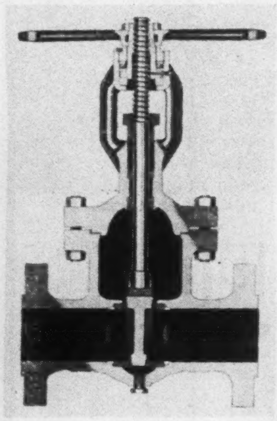
AUTOMATIC PRODUCTS COMPANY

2460 North Thirty-Second Street • Milwaukee 10, Wisconsin
Export Dept.—13 E. 40th St., New York 16, N. Y.

AP

DEPENDABLE
REFRIGERANT VALVES

New Steel Gate Valves

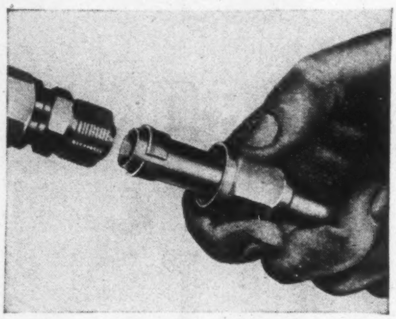


No. 2702—A new line of cast steel gate valves, with basic improvements in design, was introduced last month. To achieve perfect alignment of all working parts, close fitting wedge guide ribs are constructed by a new method which eliminates unnecessary and wear-producing drag across seating faces, says the manufacturer.

Seat rings of the valves are hard surfaced and welded integrally to the body. Specially built fixtures permit hydrostatic test of both seating faces simultaneously. All gate valves 4 in. and larger are ball bearing equipped. In the smaller sizes bearing plates for yoke bushings are "Evalized," a special plating process, to reduce operating effort.

The new valves are being built in 300, 600, 900 and 1500 psi classes and in sizes 2½ to 12 in. inclusive.—Edward Valve & Mfg. Co., Inc., 1200 W. 145th St., East Chicago, Ind.

Self-Flaring Coupling for Plastic Tubing



No. 2703—A self-flaring coupling for flexible plastic tubing was recently announced. No flaring tools are required. The flare is formed as the members of the coupling are screwed together in one operation, assuring uniform walled flare, with no thinning toward the end to weaken the tube, says the manufacturer. The plastic tubing is not preheated. It is stressed by the manufacturers that the construction, by providing a union effect, eliminates twisting and distortion of the tubing in installation, as well as split ends. Only the simplest of shop tools are required and assembly may be made right at the job. The coupling may be re-used indefinitely. Available for tube sizes ¼ to ¾ in. OD.—Packless Metal Products Corp., 31 Winthrop Ave., New Rochelle, N. Y.

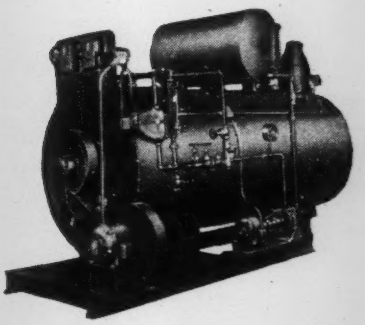
Amateur Weather Forecasts

No. 2704—Visitors to the lobby waiting room of the Allen Corp., 9767 Erwin Ave., Detroit, Mich., find a weather forecasting setup. There is a practical business basis for the installation quite apart from its decorative character and interest value to callers.

Based on the old seagoing idea that a master of steam vessels is a better man when he learned his trade in sail, the company believes a thorough understanding of the laws of meteorology is an invaluable asset to proper industrial air handling.

...FOR POSTWAR INVESTIGATE THE O&S POWERMASTER UNIT-

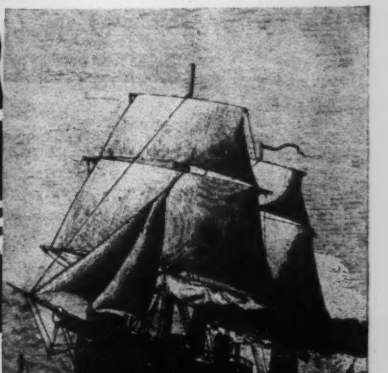
Check the advantages of this new "packaged" steam generating plant now. Fast, efficient, fully-automatic, it offers wide application in your industry for low-cost processing, power and heating. Get Bulletin #1213—write Orr & Sembower, Inc., 942 Morgantown Road, Reading, Pa.



ORR & SEMBOWER INC.
READING • PENNSYLVANIA
O&S
Builders of Better Boilers
Since 1885

THIS
WAS A MIGHTY MAN-O-WAR

Launched in 1886, the Chicago *was ultra-modern in her day. Her armament included 5", 6" and 8" guns, 12 rapid fire guns, and 1 "breech-loading rifle." She was 4500 tons; developed 5084 HP.*

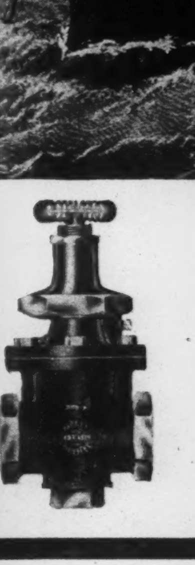


There were only 38 states in the Union the year the *Chicago* was launched. Telephones were a novelty; electric light a new-born experiment. But no longer experimental was the K & M Steam Trap. Introduced in 1879, it was a good trap—the "daddy" of all traps.

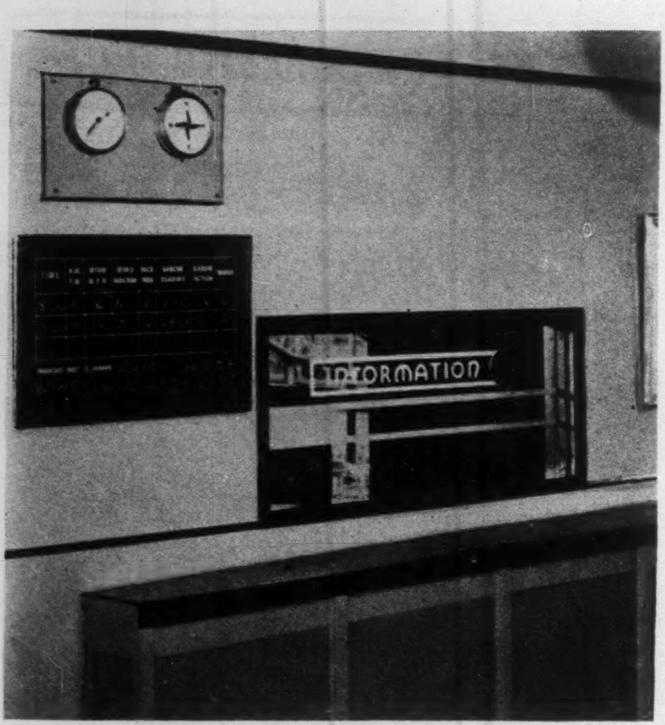
This is K & M's 64th year devoted exclusively to designing and building steam specialties and controls. In World Wars I and II we have earned citations from the government. In wartime and in peace we have earned the endorsement of American industry.

The cumulative experience of our 64 years is clearly evident in the fine valves and traps we manufacture today. For instance, type 481 A, the very compact pressure reducing valve for inlet pressures to 250 lbs., and reduced pressures of 2 lbs., to 80% of inlet. Type 481, similar, is self-contained; requires no control line.

The factory-trained K & M representative in your territory will be glad to discuss with you the applications of these or any other of the more than 100 K & M valves, traps and controls. Write for General Catalog 66.



KIELEY & MUELLER, INC.
MANUFACTURERS OF PRESSURE AND LEVEL CONTROLS SINCE 1879
NORTH BERGEN, NEW JERSEY



"In these days of enormously large war plant buildings with many acres under one roof, the performance of ventilating air tends to follow, in miniature, the habits of air in the great outdoors," says B. K. Paget, chief of the company's field engineering service. "Variations of barometric pressure within large buildings caused by heat or fan suction create horizontal winds within the building and have even been known to cau cold fronts, moisture precipitation, and temperatu inversions."

To attempt a solution of these problems on a hit o miss basis is considered fallacious practice by Mr Paget. Applying the principles of meteorology to thes enormously large wartime buildings assists consider-ably in anticipating results, he believes.

The weather forecasting is done on the basis o purely local conditions. The results are checked agains the forecasts of the U. S. Weather Bureau. Wind anemometer, and directional recording devices wer supplied by the H. J. Green Co.; recording barometer by Keuffel & Esser and Eugene J. Dietzgen Co.; an the temperature and humidity recorders by Friez.

New Principle of Burning Anthracite

No. 2705—A new principle of burning anthracite was recently demonstrated to heating equipment manufacturers at the Anthracite Industries laboratory i Primos, Pa. The development substitutes a concentrated, fast burning fire of great intensity for the present method of burning anthracite slowly in a firebox of relatively large size.

In contrast to present equipment, which burns anthracite at the maximum rate of approximately 10 lb per sq ft per hr, the new development is said to make it possible to burn 50 to 60 lb per sq ft per hr, liberating more than 500,000 Btu per cu ft as compared to approximately 50,000 liberated with present day equipment. As a result, the heat absorption per square foot

Save Fuel- Heat Uniformly, Efficiently

with
AIRTHERM
COPPER COIL, STEAM
UNIT HEATERS

For Vertical Delivery

For Horizontal Delivery

Airtherm Steam Unit Heaters are now equipped with copper coils for longer life, durability, and resistance to corrosion. They are individually controlled to afford you efficient, economical operation.

Deflectors are designed so that air velocities are increased without the necessity of extra power. Air is distributed evenly from the fans through the condenser eliminating "dead spots" and guaranteeing you full efficiency from every ounce of steam expended.

Let us show you, too, how Airtherm Unit Heaters can heat uniformly, efficiently, with a saving in fuel cost. Write today for bulletin showing detailed specifications on the complete line of Airtherm Unit Heaters.

AIRTHERM
MANUFACTURING COMPANY
711 South Spring Avenue • Saint Louis 10, Missouri

WECO-N. G. E. Series F600 GAS BURNERS

These burners are available for ratings from 50,000 to 10,000,000 B.t.u. output, for use in heating boilers, power boilers—in any metal firebox or sectional boiler.

Featuring flexibility to meet various firebox shapes and sizes at various gas pressures, and low draft loss. Full automatic controls that operate properly can be easily applied.

GUARANTEED VIBRATIONLESS

This burner operates on straight natural gas and mixed gas to 800 B.t.u. Gives perfect horizontal distribution. Write for Bulletin No. F600H.

THE WEBSTER ENGINEERING CO.

TULSA —DIVISION OF— **OKLAHOMA**

Surface Combustion . . . . Toledo, Ohio

A Few ADSCO POWER POINTERS

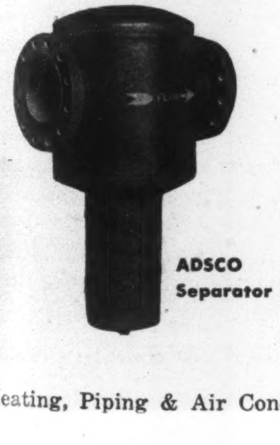
The American District Steam Co. General Offices and Works: No. Tonawanda, N. Y.

ADSCO

Separators and Strainers Keep Steam Lines Clean

The *Separators* are made of semi-steel and fabricated steel, in various types, for low and high pressure pipe lines.

The *Strainers* are furnished in "Y" and "T" types in pipe size for ½" to 2" and pressures up to 125 pounds; also can be furnished to special order.



ADSCO Separator

ADSCO "T" Type Strainer

ADSCO "Y" Type Strainer

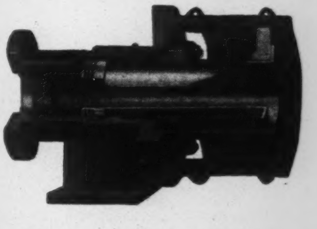
ADSCO Vertical Steam Traps Have Long Life

The reversible valve and seat of the Adsco Vertical Steam Trap gives it double life. Valve and float mechanism are mounted in the cover which may be removed without disturbing the pipe connections. The cover assembly is interchangeable. Repairs can be made quickly. Furnished either with or without thermostatic element to bypass air through the trap.

Write for ADSCO Catalog No. 35HP

ADSCO Piston-Ring Expansion Joints Can Be Packed Under Pressure

Where interruption to service must be eliminated, engineers install Adsco Piston-Ring Expansion Joints.



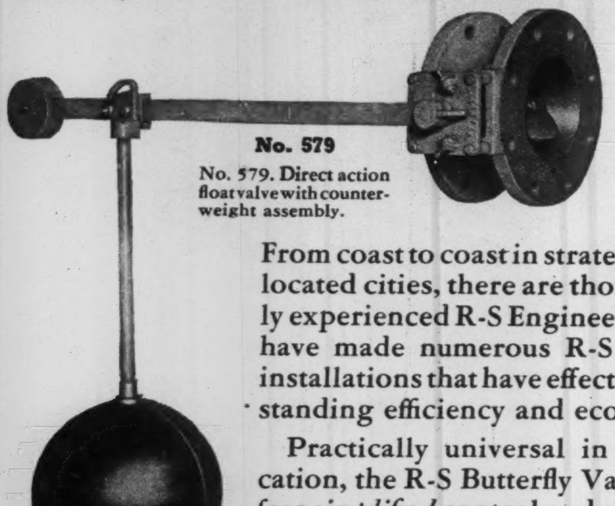
These joints incorporate all the features of Adsco's famous internally-externally guided type plus piston rings fitted in the internal guide. These hold the line pressure during the repacking operation, thereby permitting the joint to be unpacked and repacked under full operating pressure.

BUILT TO YOUR ORDER . . .

ADSCO Storage Water Heater, Horizontal Type

Storage and Instantaneous Water Heaters — Preheaters — Economizers — Condensers — Boosters and Special Units to heat or cool water, oil, acids, other liquids and gases.

National R-S Valve
Engineering Service



No. 579

No. 579. Direct action floatvalve with counterweight assembly.

From coast to coast in strategically located cities, there are thoroughly experienced R-S Engineers who have made numerous R-S Valve installations that have effected outstanding efficiency and economy.

Practically universal in application, the R-S Butterfly Valve offers *simplified* control and shut-off of volume and pressure for any material that flows or is forced through a pipe—adapted to manual, float or power operation under high or low pressures and temperatures. 15 to 900 psi.

The R-S representative is at your beck and call. Telephone the one nearest you for prompt service or write for catalog.

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R-S

VALVE DIVISION
R-S PRODUCTS CORPORATION
132 Berkley Street • Philadelphia 44, Pa.

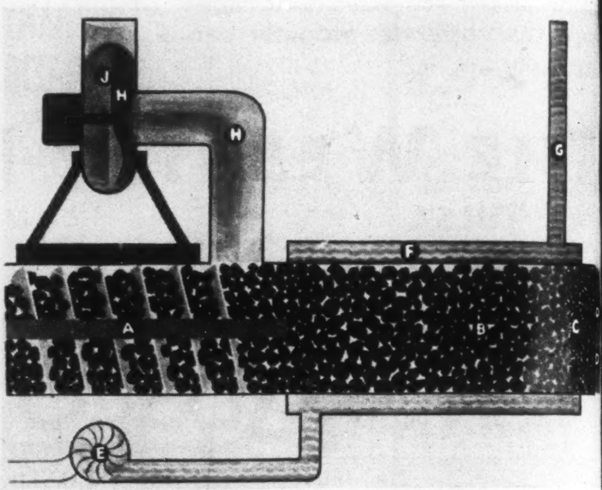
R-S Streamlined
BUTTERFLY VALVES

of heating surface is raised from 6000 to 40,000
50,000 Btu, with a reduction in the total amount of
consumed during the heating season.

Although the new principle has not yet been inc
porated in equipment available to the consumer, a nu
ber of manufacturers already are working on desig
for its application in both the home and industrial fiel
it is announced.

Equally effective with either hot water, steam,
warm air systems, the mechanism for applying
principle consists of a hollow tube 6 or 8 in. in diame
and approximately 18 in. long. The anthracite is
into the tube automatically; the coal burns in the cen
of the tube, and the ash is discharged at the other e
Water or air is circulated around the hot part of
tube in a small, compact jacket.

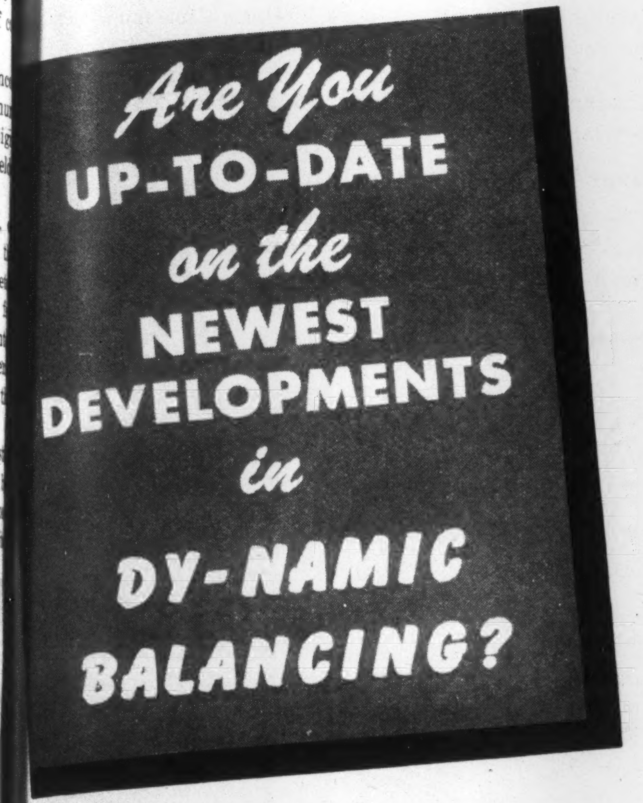
"The principle is founded upon a basic characteris
of anthracite combustion which has been confirmed
research in the laboratory," Dr. Raymond C. Johnso
vice president in charge of research for Anthrac



**Revolving worm (A) introduces the coal automatically int
one end of the tube. The coal burns in the center of th
tube (B), and the ash is discharged at the other end (C)
Draft is provided by air which enters at the ash end of th
tube (D) and is drawn through the incoming coal by a
induced draft fan (J) in the smoke pipe (H). Water (F
is circulated around the tube by a water circulator (E) an
carries the heat to the building through the outlet pipe (G**

Industries, explained. "Anthracite, unlike most othe
fuels, under proper conditions can be made to burn t
complete and perfect combustion within its own area
without the necessity for secondary air or secondary
combustion spaces.

"Heretofore practically all heaters were designe
with large grate areas with extensive combustion spac
above the fire bed so that the large quantities of carbo
monoxide which were formed could be burned above th
bed with secondary air. As a result, this equipmen
contained several times the bulk and weight that i
necessary in a furnace especially designed to take advantage of anthracite's particular combustion requirements. The complete absence of complicated flue passes
or secondary heat absorbing surfaces in this new method of burning does not lower efficiency, because the
heated products of combustion flow through the col
incoming coal to stimulate ignition and to use the coa
as an economizer, replacing conventional secondary
heating surfaces.



Are You
UP-TO-DATE
on the
NEWEST
DEVELOPMENTS
in
DY-NAMIC
BALANCING?

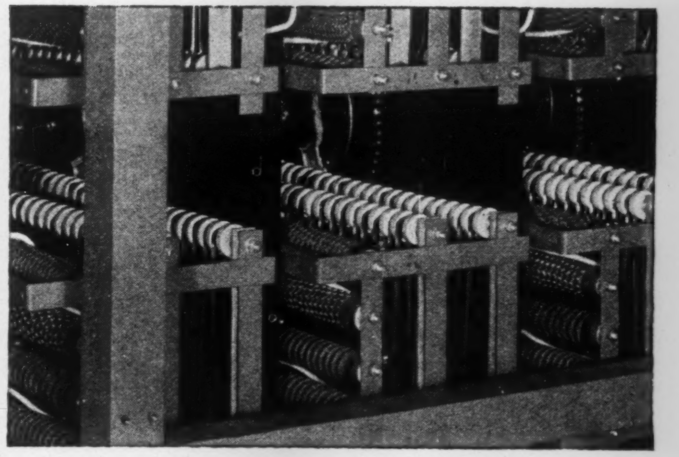
ow that Bear Machines Simplify and ash Cost of Dy-Namic Balancing . . .

MORE and MORE manufacturers will feature and buyers will specify DY-NAMICALLY BALANCED PARTS

Every month sees more and more manufacturers GETTING DELIVERIES on Bear Dy-Namic Balancing Machines . . . getting set to feature the improved performance that Dy-Namic Balancing alone can make possible. Bear Engineers are constantly working with manufacturers on their specific balancing problems. Where special balancing machines are required, Bear engineers are furnishing them at reasonable cost.

If you are now manufacturing or contemplate post-war production of machines or parts with rotating parts, we suggest that you send for a free copy of our latest DATA BULLETIN containing the latest information regarding our developments. If possible, include specifications of parts to be balanced so that we may send you SPECIFIC SUGGESTIONS and RECOMMENDATIONS. Write . . . Wire or PHONE. Bear Mfg. Co., Dept. HP, Rock Island, Illinois.

BEAR
COMBINATION
TATIC AND DY-NAMIC BALANCING MACHINES



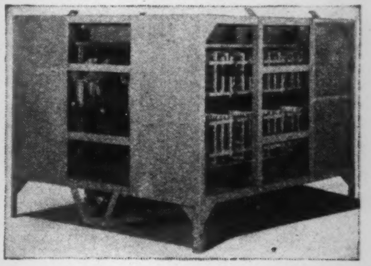
ADAPTABLE *and* DEPENDABLE

RESISTORS

ADAPTABILITY and dependability of resistors assume primary importance in the assembly of large rheostat control units. The wide range of resistance values and capacities that can be built up from the Ward Leonard line is limitless. The many types and mounting arrangements permit the meeting of load requirements in minimum space. It is obvious in an assembly as shown above that the dependability of the individual resistor is an absolute essential.

For over fifty years industry has looked to Ward Leonard for both resistors and resistor assemblies. This experience has given Ward Leonard Engineers the viewpoint of user and designer. It is reflected in the completeness of the Ward Leonard line of Resistors.

Whatever your requirements you will find a Ward Leonard Resistor that exactly meets your conditions. Send for Bulletins.



This motor operated Ward Leonard assembled rheostat is built up from several types of Ward Leonard Resistors.

ARMY E NAVY

WARD LEONARD

RELAYS • RESISTORS • RHEOSTATS

Electric control (WL) devices since 1892.

WARD LEONARD ELECTRIC COMPANY
31 SOUTH STREET, MOUNT VERNON, N. Y.

"The efficiency is further heightened by the fact that the coal cannot clinker. Despite the higher rate of burning, it is not possible for clinkers to form, because the small size of the fire bed permits the water surrounding the tube to carry off the heat so rapidly that the actual temperature of the burning coal is lower than the point at which clinkers form in an anthracite fire.

"As the development thus represents a principle of combustion rather than of equipment design, the flexibility of application is unlimited. This principle may be employed in the design of equipment for large or small homes, central heating units or space heaters, hand-fired or fully automatic furnaces. Regardless of the forms which the various applications take, however, they will have the universal advantages of extreme simplicity, high efficiency and unprecedented compactness.

"In adaptation to fully automatic equipment, the anthracite is fed into the tube by a conveyor leading directly from the coal supply. The ash is discharged into enclosed, dustproof containers, which would need to be replaced only two or three times a week, or directly into pits prepared for the purpose."

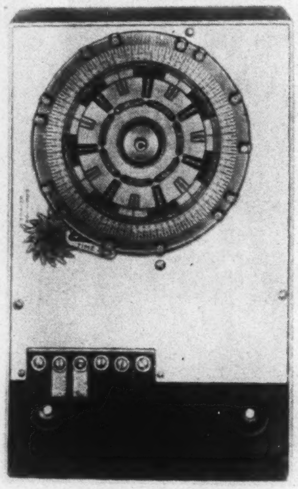
Method of Surface Inspection

No. 2706—"Faxfilm" is a recently announced method of surface inspection and comparison. The process is simple. By the use of a solvent, one surface of a plastic film is softened enough to permit the making of a contact replica of any surface. This small piece of film is mounted in a cardboard frame which fits any standard projector where it can be enlarged 100 diameters or more and shows all contours in three dimensions. The film can be filed for future record, if desired.

The film is available in kits with sufficient materials to make 250 replicas.—R. D. McDill, 5109 Mayfield Rd., Cleveland, Ohio.

Seven Day Dial Time Switch

No. 2707—A new development in time switches is the "700 Series" seven day calendar, dial time switch which has—says the manufacturer—demonstrated its worth for timing automatic heat, ventilating, lighting, pumping, or flushing operations. These switches are equipped with 6 in. calendar dials which make one complete revolution every seven days. Dial trippers can be independently set for different daily on and off schedules. Settings can be made in advance for an entire week. Any day or days' operations may be omitted entirely on a preset program.



Each day of the week is clearly separated from other days and is graduated into hours and half hours with day and night distinctly separated. Operations from on to off or from

QUICK CLEAN-OUT, INSPECTION OR REPAIR
... WITHOUT BREAKING PIPE CONNECTIONS!

Economy Double Suction Pumps sustain high rated efficiency over a long period of years by virtue of the unusual features engineered into them.

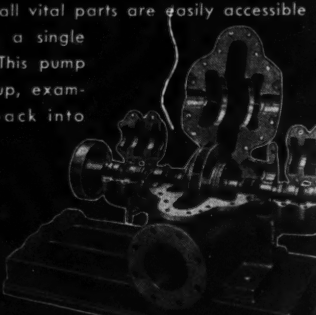
- **Rotor supported between two liberal outboard bearings—giving longer life than is possible with overhung construction.**
- **High efficiency compared with other types, because inlet dia. can be kept small while leakage and friction losses are considerably reduced.**
- **All parts subject to wear are readily removed, without disturbing alignment of unit.**
- **End thrust is almost negligible—thus bearing construction is very much simplified.**

These, and many other Economy advantages, are fully described in free descriptive literature. Write for your copy today.

Special **ECONOMY** *design features*

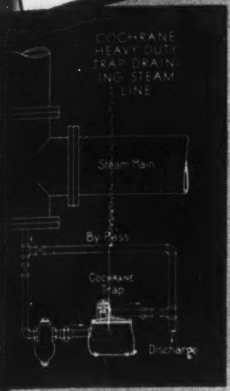
PERMIT EASY REMOVAL OF PARTS!

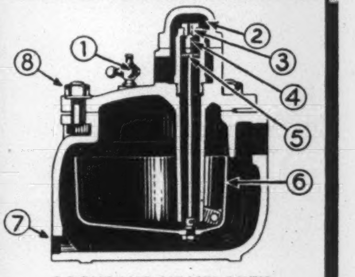
Periodic inspection of pumping equipment is a maintenance "must" today. In the Economy Horizontally Split Case Pump all vital parts are easily accessible without breaking a single pipe connection. This pump can be opened up, examined and put back into service with a minimum of time and effort. Expense due to shutdowns and long delays is thus avoided.



ECONOMY PUMPS, INC.
HAMILTON, OHIO, U. S. A.

COCHRANE *Drainage* EQUIPMENT


COCHRANE HEAVY DUTY TRAP DRAINING STEAM LINE
Steam Main
By Pass
Cochrane Trap
Discharge

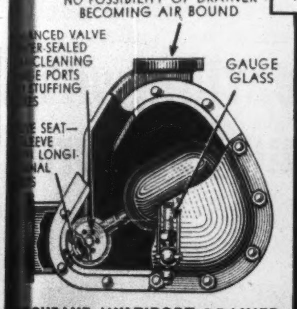


COCHRANE HEAVY-DUTY STEAM TRAP

1. Air removal vent cock
2. Removable valve bonnet
3. Easilychanged valve seat
4. Stainless steel valve
5. 4 centering arms
6. Large displacement bucket
7. Opening for drain or blow-off
8. Bolts for easy accessibility

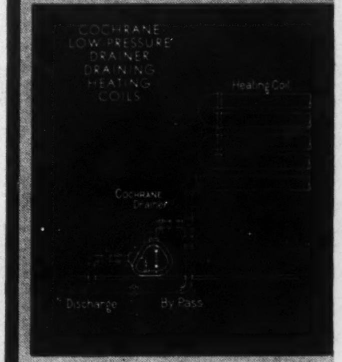
ADVANTAGES

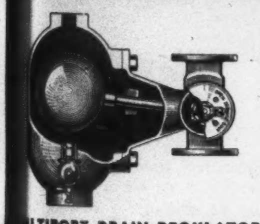
Only eight parts. Large cast-iron bucket holds valve tightly to seat until water overflows rim, opening valve wide. No levers, restricted passages or stuffing boxes to become clogged. Seat easily changed for various discharge rates. Write for Publication 2850.


INLET AT TOP—
NO POSSIBILITY OF DRAINER BECOMING AIR BOUND
GAUGE GLASS
NCED VALVE
ER-SEALED
CLEANING
E PORTS
STUFFING
E SEAT—
EEVE
LONGI-
NAL

CHRANE MULTIPORT DRAINER

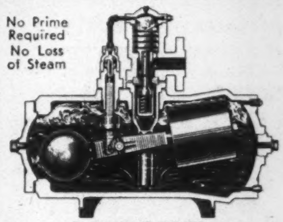
ow pressure drainer especially suited operation at low differential pres- es because of its very large port as which provide a tremendously ge discharge capacity. It uses a rotat- cylindrical valve, directly attached he float stem. Publication 2925 gives ails.


COCHRANE LOW PRESSURE DRAINER DRAINING HEATING COILS
Heating Coil
Cochrane Drainer
Discharge
By Pass



LTIPORT DRAIN REGULATOR

scharge regulated by height of ndensate in body. Exceptionally rge capacity.


No Prime Required
No Loss of Steam

DISCHARGER

For removing large quantities of condensate under high pressure (150 to 2000 lb./sq. in. or higher).

OCHRANE CORPORATION • 3131 N. 17th ST., PHILA., PA.

COCHRANE

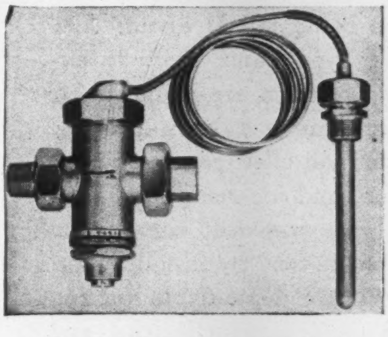
Conserve Fuel NOW with Sterling THERMOTROL RADIATOR CONTROLS

All owners and users of heating systems employing hot water, steam, vapor and vacuum are now free to enjoy the FUEL SAVING BENEFITS of Sterling THERMOTROLS—automatic radiator controls . . . savings which in the past have ranged upwards to as much as 25%!

THERMOTROLS, completely self-contained, thermostatically operated, are easily installed on each radiator. Set to any desired degree of heat, they automatically maintain steady, comfortable room temperature, prevent costly overheating.

Conserve vital fuel! Equip ALL your radiators with THERMOTROLS NOW! Available for concealed or exposed radiators, for two-pipe steam, vapor and vacuum systems, and one or two-pipe hot water systems. Write for Bulletin 443.

STERLING THERMOTROL
For Liquids and Processing



Self-contained, self-operated, this Thermotrol maintains accurate temperatures for more efficient and economical operation of hot water storage tanks, heat exchangers, process cookers and sterilizers. For pressures to 125 lbs. temperature ranges to 250° F. Write for details.

STERLING, INC.

3738 N. Holton Street, Milwaukee 12, Wisconsin

Manufacturers of a Complete Line of Heating Pumps . . . Temperature Controls . . . Heating Specialties

What type heating for postwar homes?

CIRCULATING WATER
PANEL HEATING
RADIANT HEATING
ONE PIPE STEAM
CONVECTORS
AIR CONDITIONING
BASE BOARD UNITS
WARM AIR
PLENUM CHAMBER UNIT

Confused—are you—about the many new heating systems being talked about? . . . Well, remember, you can't afford to experiment. Some of them are bound to be good and when this has been proved, National Radiator will offer them to you . . . In the meantime, and for some time after the war, you will serve your customers best by installing the latest, most dependable systems —the "National" radiant warmth units.

For Outstanding Production Achievement

Send for booklet—"True Heating Comfort"

The NATIONAL RADIATOR Co.

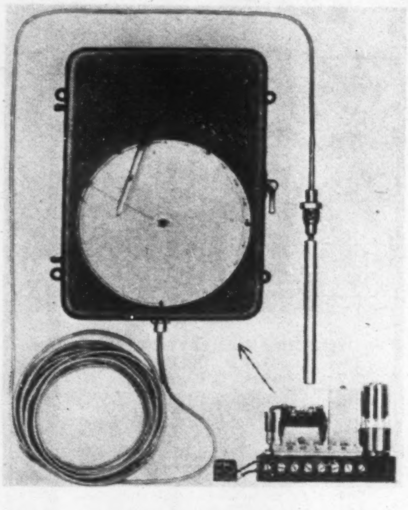
229-T CENTRAL AVENUE · JOHNSTOWN, PA.

50 YEARS OF DEPENDABLE SERVICE

off to on can be set as close as 3 hr apart and can be separately adjusted throughout each 24 hr day in the week.—Paragon Electric Co., 37 W. Van Buren St., Chicago 5, Ill.

Electronic Controller

No. 2708—A new electronic controller operates on the shielding effect of a vane passing between two coils in an electronic circuit. Recording and indicating models are offered for automatic control of temperature, pressure, liquid level, and humidity. The following types of control operation are available: low-open, high-open, low-high, low-open-high, and low-normal high.



The new controller for temperature is offered in ranges from —125 F to +1000 F for use in conjunction with motor and solenoid valves, relays, main line switches, and other fuel control apparatus for controlling the temperature in electric, oil, gas fired, and steam heated

SAVE on Fall heating with these ELECTRIC unit heaters

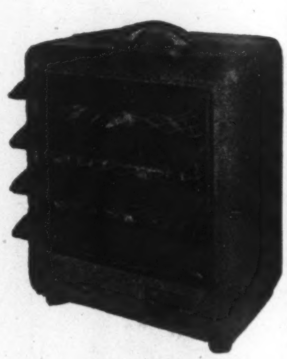
SAVE MONEY—Chromalox electric unit heaters work ONLY when NEEDED. No steam boiler operation, no manpower expense.

SAVE TIME—They give you INSTANT heat, and at ANY TIME—working days, holidays, overtime, Sundays.

SAVE HEALTH—They circulate stimulating, warmed air—where you want it. Prevent colds, sickness, absence. No flame-vitiated air.

SAVE INSTALLATION COSTS—Wired power will go anywhere—easily, inexpensively.

SAVE TROUBLE—No piping problems, leaks, condensate troubles,—and no flame hazard.



The Type HF unit heater, in four sizes—1.5 to 4-kw. Other types up to 40-kw. for heating large areas. Chromalox unit heaters can be supplied with thermostatic control if desired. Available on proper priority.

CHECK NOW ON

CHROMALOX Electric UNIT HEATERS

Tell us your conditions—let us submit an estimate on costs, and recommend equipment.

Write for the **CHROMALOX CATALOG**

EDWIN L. WIEGAND COMPANY
7610 Thomas Blvd. Pittsburgh 8, Pa.

THE POST WAR SHAPE OF
THINGS TO COME . .

will be better, because of

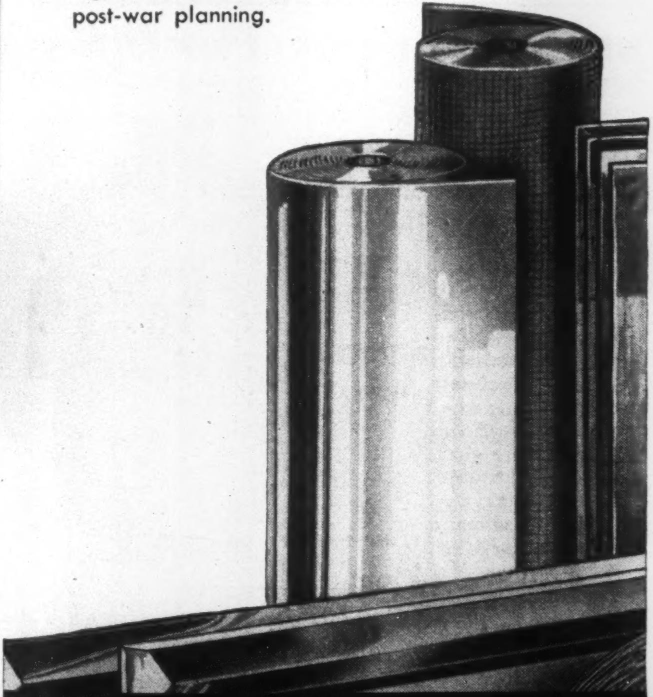
HUSSEY *War Developed*

COPPER PRODUCTS . . .

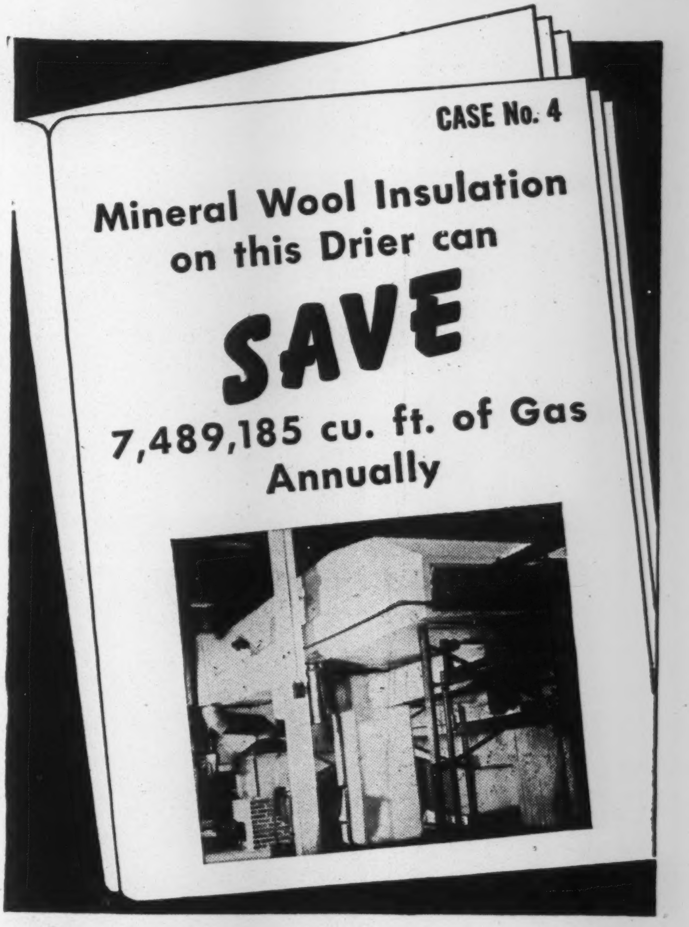
When the ticker spells out P-E-A-C-E, the HUSSEY organization will play another important role *as one of America's leading sources of Copper for more efficien. gracious living in tomorrow's copper world.*

Many aggressive manufacturers have been exploring every possibility for more extensive use of war-developed and improved copper products that will provide greater economy, utility and efficiency in their post-war products.

You, too, can profitably use Hussey engineering facilities for practical, experienced aid in post-war planning.



C. G. HUSSEY & COMPANY
(Division of Copper Range Co.)
Rolling Mills and General Offices: PITTSBURGH, PA.
Warehouses in Principal Cities


CASE No. 4
Mineral Wool Insulation on this Drier can
SAVE
7,489,185 cu. ft. of Gas Annually

Free Heat and Power Conservation Manual tells how you can save fuel in your plant. Write for copy

Read how easily you can save as much as 88 tons of coal a year on a hot storage tank . . . 68 tons on a boiler setting . . . 168 tons on a boiler shell. You will find these and other case studies in this new manual.

You too, can save heat and power in your plant, with Mineral Wool Insulation. It is economical—does more for less. It has extra low thermal conductivity, is inherently fire-resistant, long lived. Comes in six convenient forms, is light, easy to apply, always available.

Cooperate with your government's drive to save critical fuel. Stop heat losses now. Send for your copy of this free manual today. Write to Industrial Mineral Wool Institute, 441 Lexington Avenue, New York 17, N.Y. Dept. H10.

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IF IT'S TOO HOT TO TOUCH
IT NEEDS INSULATION

Mineral Wool Insulation is also effective for controlling cold temperatures and is an excellent fire-retarder.

MINERAL WOOL INSULATION PRODUCTS
for high and low temperatures
BLANKETS · FELTS · BLOCKS · CEMENTS · PIPE COVERINGS · FILL MATERIALS

Why leading
Refrigeration Engineers
prefer
Johns-Manville
ROCK CORK

JM
ROCK CORK
Johns-Manville

Here are a few of the outstanding reasons why Johns-Manville Rock Cork is specified by so many leading refrigeration engineers:

BASICALLY MINERAL—Rock Cork is made of mineral wool with a waterproof asphaltic binder.

RESISTS MOISTURE ABSORPTION—Rock Cork is thoroughly sealed against air and moisture infiltration, thus eliminating the direct cause of most insulation failures.

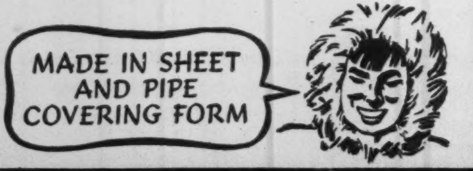
SANITARY—Rock Cork will not harbor vermin, and cannot support the growth of mold or bacteria.

LOW CONDUCTIVITY—Rock Cork's rating is less than 0.33 Btu per sq. ft. per deg. F. temperature difference per in. thick, per hour at mean temperature below 100° F.

TIGHT JOINTS—This unique advantage of Rock Cork is made possible by the fibrous nature of the material.

STRUCTURALLY STRONG—Rock Cork may be handled without danger of breakage. Yet, it may be sawed and worked with ease on the job.

Rock Cork has proved successful through years of service. Many installations are still effective today even after 35 years' use. For more facts, write for brochure DS-555, Johns-Manville, 22 East 40th Street, New York 16, N. Y.


MADE IN SHEET AND PIPE COVERING FORM

JM PRODUCTS
Johns-Manville
ROCK CORK

ovens, dryers, dehydrators, oil baths, smoke houses, tanks, and other similar industrial apparatus.

The pressure controller is available in ranges from full vacuum to 6000 psi and in addition is available for automatically controlling liquid level. The humidity controller operates from a wet and dry bulb type of element with separate control for each bulb. The device is also offered as a time program controller for automatically controlling temperature, pressure, liquid level, or humidity according to a definite time schedule. —Bristol Co., P. O. Box 1790, Waterbury 91, Conn.

Commercial Production of Silicone Fluids

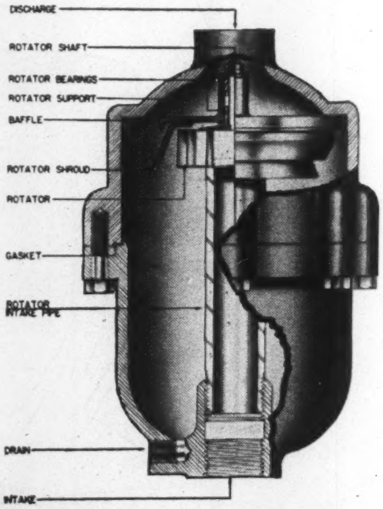
No. 2709—Liquid silicones are in quantity production, it was announced recently. These new organo-silicon products have been available for many months but their use has been restricted to a few applications essential to the war effort. Recent expansion in production capacity now permits them to be offered for adaptation to any war use indicated by their unusual combination of properties.

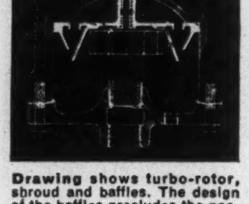
These fluids are water white and are characterized by an extremely low rate of viscosity change with temperature, compared to petroleum oils of equivalent viscosity. They also have higher flash and fire points and a complete freedom from solvent or swelling effect on synthetic or natural rubber and on many kinds of plastics, says the manufacturer. They are not affected by oxygen under pressure at ordinary ranges of temperature. Since they are resistant to oxidizing solutions, mineral acids, salts and alkalies, they have proved to be highly useful as an impregnant for asbestos packing

NEW TURBO-ROTOR *Pur-O-fier*

For Compressed Air

This new unit effectively eliminates moisture, oil and scale from compressed air lines. Pur-O-fier utilizes the principle of centrifugal force to separate entrainments from purified air. Once installed it requires absolutely no maintenance. Penstar Tru-Bond oilless bearing guarantees long, trouble-free operation. Manual or automatic drains provided.





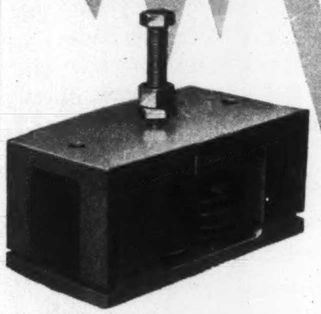
Drawing shows turbo-rotor, shroud and baffles. The design of the baffles precludes the possibility of capillary action of entrainments resulting from high velocity.

THREE MODELS AVAILABLE—A-1 will accommodate volumes from ½ to 5 cu. ft. A-2, volumes from 10 to 35 cu. ft. A-4, volumes from 35 to 100 cu. ft. Multiple units are recommended for volumes above this range. Pur-O-fier is the only standard unit that can be engineered to meet any air volume for regular or intermittent service.

BIRD-WHITE COMPANY
3120 West Lake Street, Chicago, Illinois
Dept. H.P.

AND NOW THIS NEW LOW COST VIBRATION ISOLATOR FORMS A PART OF.. KORFUND

VIBRATION CONTROL



The TYPE SL VIBRO-ISOLATOR incorporates in one simplified unit the best design features and advantages of four well-known Korfund models. Steel springs, with the familiar Korfund adjustment feature, for the control of vertical vibration are combined with self-adjusting isolation members for the control of lateral vibration.

This unit is particularly well suited to ventilating and air conditioning applications because, in addition to preventing the transmission of vibration to the building structure, it cushions impacts from all horizontal directions on installations where unbalanced forces, centrifugal action or external belt pulls are encountered.

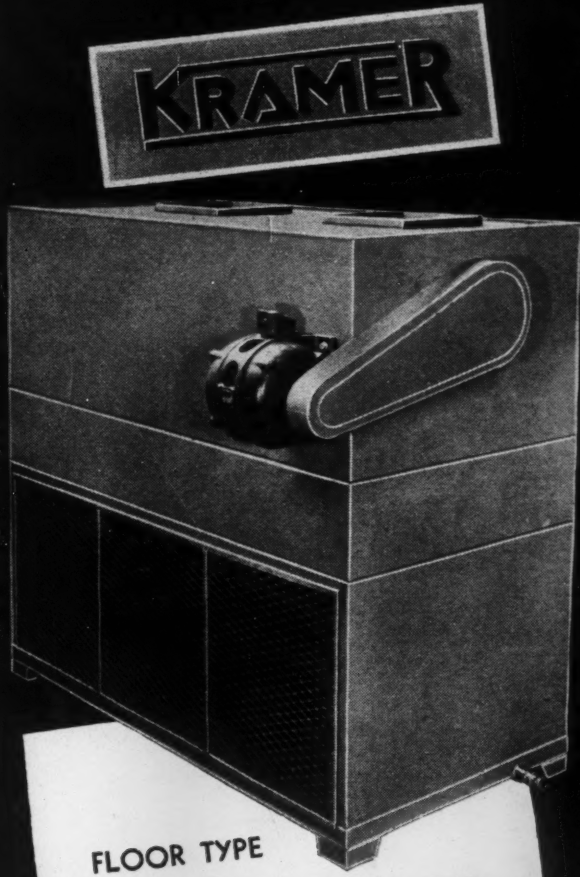
THE KORFUND COMPANY, INC.
48-36 Thirty-second Place, Long Island City 1, N. Y.

Representatives in Principal Cities

KORFUND
VIBRATION CONTROL

KORFUND
UNIVERSAL VIBRO ISOLATOR
ALL PURPOSE · ALL DIRECTIONAL

Write for copy of new catalog . . . just off the press . . . which describes this unusually low cost, all purpose vibration control unit. Ask for Catalog SL 500. No cost . . . no obligation.



FLOOR TYPE

UNIT COOLER

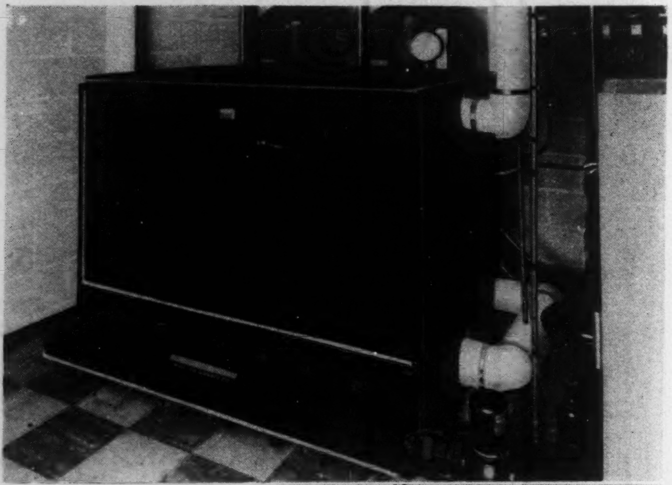
HERE is a sturdy, efficient unit cooler designed for use in large cold storage rooms and so constructed that it may be used with or without ducting.

It is built in three sections to simplify the installation where doorways are narrow.

This Kramer Unit can be furnished with top or front discharge.

Complete information and performance data will be supplied upon request.

KRAMER TRENTON CO.
TRENTON, 5, N. J.



• Residential installation of 15-section Mueller Series C gas-fired hot water boiler with five zones of control. Concealed radiation.

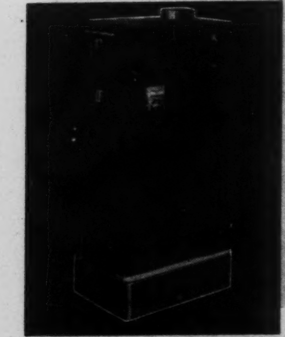
Right from the start, you deliver real satisfaction . . . with a

MUELLER Gas-fired Boiler

Owners, architects, builders, utilities immediately recognize the Mueller name . . . prominent in heating for 87 years, and in the gas boiler field practically from its inception . . . nationally advertised, and nationally known for highest standards.

These all-cast-iron, gas-designed boilers are easy to install; Mueller assembles and pressure-tests all castings at the factory, assuring a positive, watertight assembly on the job.

Mueller quality never lets you down. Definite Mueller features assure economical operation, long life, and freedom from service troubles . . . the factors that maintain your reputation for making wise selections. Mueller gas-fired boilers are easily cleaned. Surface-ground, iron-to-iron contacts. Simple non-mechanical burner and complete automatic controls. Install the Mueller Gas-fired Boiler. Write for bulletins. *L. J. Mueller Furnace Co., 2007 W. Oklahoma Avenue, Milwaukee 7, Wisconsin.*



Adaptable to steam, hot water (gravity or forced circulation), or vapor heating; direct or indirect hot water supply.

A.G.A. ratings 290 to 20,100 sq. ft. (hot water), 180 to 12,600 sq. ft. (steam or vapor) with one set of controls. Groups or batteries in any required capacity.

Series A *(at right)*
for residences and small commercial installations.

Series C *(at top of page)*
for larger residences, apartments, stores, commercial and industrial buildings, etc.

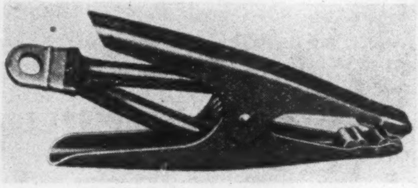
E-12

GAS-FIRED BOILERS AND UNIT HEATERS

and gaskets in chemical pumps.—Dow Corning Corp., Midland, Mich.

Ground Clamp for Welders

No. 2710—A new ground clamp for welders is designed so that each jaw connects independently to the ground cable. Thus, if one jaw is prevented from making a good electrical contact, due to any reason such as heavy scale, paint, etc., the other jaw will carry the current. The ground clamp has a heavy duty processed steel frame with durable copper conductors and contacts, weighs only 1½ lb, has a maximum jaw spread of 2½ in., and a rating of 300 amp.—Lincoln Electric Co., 12818 Coit Rd., Cleveland 1, Ohio.



Four New Insulation Products

No. 2711—The addition of four new products to a comprehensive line of insulating materials was announced last month.

"Swetchek," an insulation for minimizing condensation, for use on cold water lines, water coolers and softeners, storage tanks, filters, and condensers, is a prepared plastic coating resistant to abrasion, and black in color. "Drycote," a companion product in combatting condensation, is a plastic coating, white in color, and packaged in dry form. When mixed with water and applied by trowel or hand application to any clean dry surface, it becomes smooth and glossy white in color and sets into a hard surface, says the maker.

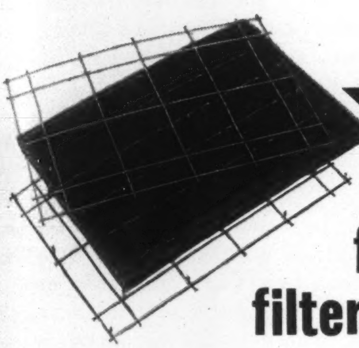
"Hadesite" is a fireproofing insulating cement for high temperature work. Mixed with water, it is troweled to a smooth hard finish of salmon color and is used primarily for fireproofing structural steel, lining high temperature ducts, fire doors, etc. It is used to temperatures to 1900 F, says the maker.

"43" finishing cement is used for finishing interior insulation work where a hard, smooth surface is desired. It can also be painted and withstands temperatures to 800 F, according to the manufacturer.—Eagle-Picher Sales Co., American Bldg., Cincinnati 1, Ohio.

Valve for Water Lines to Unheated Areas

No. 2712—A new metering and automatic waste valve for water supply lines to unheated areas, especially to spray nozzles, provides two services in one compact assembly—it offers an automatic drain to prevent freezing, and at the same time provides metering means. Such an arrangement for automatic draining is desirable where spray nozzles on evaporative condensers are located in unheated areas, on supply lines to roof ponds and spray nozzles, and supply lines to outside sill cocks, etc., says the manufacturer.

It is ordinarily used in conjunction with a standard solenoid valve which may be controlled by outside thermostats, timers, or any other desired means. Both the solenoid and the metering and automatic waste valve should be installed in a heated area.

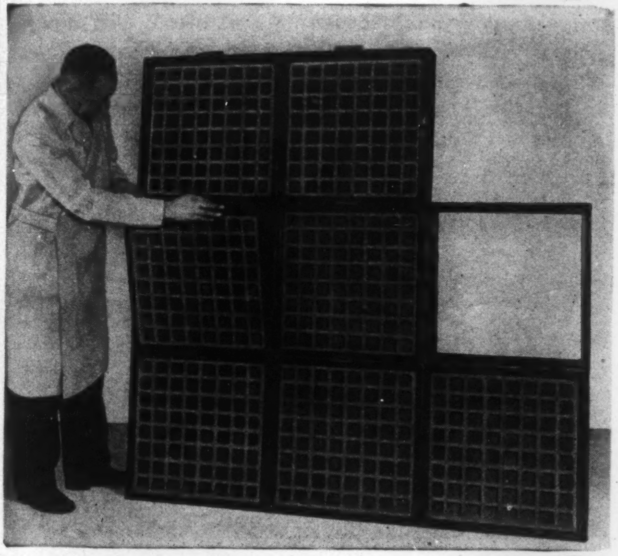


for filter banks

Research Air Filters are now used in leading office buildings, theatres, banks, department stores, clothing stores, restaurants, factories, homes, even in the crack streamline trains.

Research Air Filters have proven their efficiency in industrial dust removal, central air conditioning, ventilating systems, railroads, forced warm air furnaces, unit air conditioners, paint spray booths, and air intakes on diesels and air compressors.

Write for technical data sheets.



RESEARCH AIR FILTER

Pictured above—the Research No. "200" Series Filter is available for all standard sized filter banks. The most popular sizes are—20x25x2; 20x20x2. Also available in one inch thickness.

RESEARCH PRODUCTS CORP.
1015 E. Washington Avenue
Madison, Wisconsin

Swartwout AIRMOVER

Ultra-modern ventilation that meets your ideal of adaptability for industrial and commercial remodeling and modernization

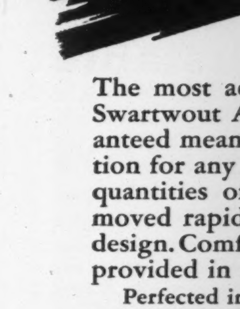
The most advanced ventilating method—Swartwout AIRMOVER—gives you a guaranteed means of providing *natural* ventilation for any industrial building. Enormous quantities of heat, smoke and fumes are moved rapidly through its low-air-friction design. Comfortable working condition sare provided in all areas.

Perfected in thousands of feet of installations on vital war production plants, AIRMOVER's high efficiency and unusual adaptability make it the ideal equipment for remodeling and modernization—as well as for new construction.

AIRMOVER gives you low cost ventilation without complicated structural work. It's only 32" high—is hardly noticeable on the roof. Although standard units are 10'x 7' 6", AIRMOVER can be custom-built if necessary to fit special structural conditions.

Swarwout air movement engineering helps you achieve completely successful results. Write for full information on the AIRMOVER.

THE SWARTWOUT COMPANY
18511 EUCLID AVE., CLEVELAND 12, OHIO


LIKE OPENING YOUR ROOFS TO THE SKY

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Specialists in Air Movement by *Natural* Methods

NO COSTLY "CALL-BACKS"
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Waterloo AIR DIFFUSERS

You never have to go back on a job to replace registers and grilles for correcting air distribution, when you use Waterloo Air Diffusers.

Instantly Adjustable
TO INSURE
CORRECT DISTRIBUTION

The exclusive INDIVIDUALLY ADJUSTABLE BLADES on each Waterloo grille permit any variety of adjustment of air flow, even after the grilles have been installed. With ONE grille you can focus air flow in any direction, up, down, right or left—or diffuse it in all four directions at the same time—and can cut or lengthen the air throw, as desired.

Streamlined Blades Reduce Noise

Because of Waterloo's special streamlined blades, high velocity air is handled without grille noise or turbulence. Waterloo installations are quiet, draft free—make SATISFIED customers. And after the war, Waterloo's new and improved type "grilles of the future," are going to be even further ahead of the parade.

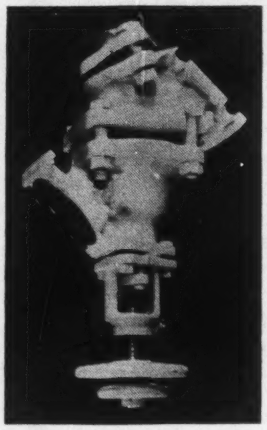
WRITE *today* for full information, and name of your nearest Waterloo representative.

Waterloo REGISTER CO.
Established 1902
Waterloo, Iowa—Seattle, Wash.
Representatives in All Principal Cities

If automatic action is not desired, an ordinary hand shutoff valve may replace the solenoid. In this case, the automatic waste feature will function when the hand valve is turned off. The capacity metering stem is designed for external adjustment.—Alco Valve Co., 865 Kingsland Ave., St. Louis 5, Mo.

Glass Lined Valves

No. 2713**—Heavy duty acid resisting valves made with cast iron bodies lined with glass, and fitted with porcelain valve seats and heads are offered to meet the demands of new industrial processes involving corrosive acids and high pressures. Interchangeability of the bodies with the operating mechanism and the porcelain parts permits their use as flush, globe, pop safety, or relief valves.



Regrinding and refitting of the valve plug in the seat can be done by turning the lower grind-in wheel. This is done each time the valve is used, to remove any adhering solids from the valve seat.

The valves can be attached to 125 lb cast iron or 150 lb steel flanged fittings, as the valve flanges have the same bolt circle and number of bolts. They can be substituted for standard flanged elbows or tees in existing lines, as overall length, face to face, of the valves is the same as that of tees and elbows.—Pfaudler Co., 89 East Ave., Rochester 4, N. Y.

EFFICIENT
ECONOMICAL

De Luxe type WK Pressure Actuated Water Regulating Valves for Freon, Sulphur or Methyl, are pilot operated, modulating. Standard adjustable opening range from 50 to 150 lbs. Factory set to open at 90 pounds. Precision engineering and individual testing for low cost, satisfactory performance. Available in sizes of ¾ to 2 inches FPT. Simple adjustment—easily serviced.

Other sizes and types are also available.

Electrimatic
2100 INDIANA AVE. CHICAGO 16, ILL.

Do You Know
a better way

...to heat a house?
...to cool a house?
...to heat water?
...to refrigerate food?
...to build a temperature control?
...to make an automatic valve?

If you have developed a better way to do any of these things and if your ideas can be protected... *here* is your opportunity!

The AiResearch Manufacturing Company is preparing *now* for the postwar period and is in the market for ideas, inventions and products for postwar development, manufacture and sale.

AiResearch has skilled engineering and production groups at present engaged in development and manufacture of oil coolers, intercoolers, exhaust heat exchangers and cabin pressurizing equipment for wartime aircraft. In peacetime this organization will continue the job of improving aircraft, for which it has three times won the Army and Navy "E" since Pearl Harbor. But also its fully equipped laboratories and manufacturing plants will be able to develop improved peacetime products for better postwar living... and its well-organized sales force will be given the job of their promotion.

On an outright purchase or royalty basis, AiResearch is ready *now* to negotiate for exclusive rights to those ideas and inventions believed practical to its abilities and resources. AiResearch would like to hear about *your* idea. Write as fully as possible. You will receive a prompt answer and your correspondence will be held in confidence.

***Address:* POSTWAR PLANNING COMMITTEE**
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9851 Sepulveda Boulevard, Los Angeles 43, California

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DIVISION OF
THE GARRETT CORPORATION

BURKS
JOBBERS-DEALERS
HAVE POST-WAR
PLANS READY

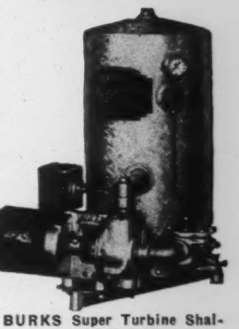
Get full details now on Burks Post-war dealer set-up

It is time, right now, to get in line for the greatest prosperity the water system business has ever known. BURKS Jobber-Dealer organization is ready for post-war business with the finest line of water systems money can buy and they'll be backed up to the limit by the sales policy that has made the BURKS Dealership the most desirable of all. BURKS Dealers and Jobbers prosper best because

- **The BURKS Line of Quality Water Systems return a good profit and are easy to sell.**
- **The BURKS Shallow Well and Deep Well Systems are as near trouble-free as can be made. No expensive call-backs necessary once the system is installed.**
- **The BURKS Line is complete — a system for every requirement.**
- **The BURKS Systems have features no competitive system can offer. These features mean extra sales.**
- **The BURKS Sales Policy insists on all sales coming through the jobber-dealer organization. This policy is never violated.**
- **The BURKS Sales and Engineering Staffs work hand in hand with BURKS Dealers and Jobbers. We have no other business to divert our efforts.**
- **The BURKS Dealer and Jobber is benefited by constant magazine advertising and an effective direct-to-prospect mail campaign.**

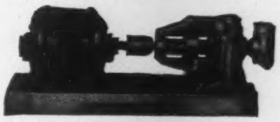
The post-war period is going to be a real era of prosperity for the men who handle the BURKS Line. Now is the time to get in line for your share.

Write for complete details.

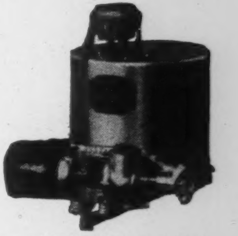


BURKS Super Turbine Shallow Well System

BURKS Vertical Educer, Deep Well System



BURKS Heavy Duty Super Turbine—Large capacity pressures up to 150 pounds



BURKS Condensation Return Units — both single and duplex types

DECATUR PUMP CO.
Makers of *BURKS QUALITY* Water Systems
41 Elk St. Decatur 70, Ill.

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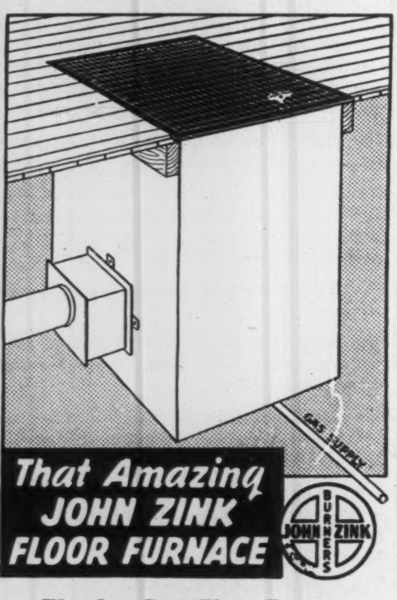
As you would expect this furnace features a larger, improved Combustion Chamber and a One-port Non-plugging Gas Burner.

FEATURE—Rapid Air Circulation, Quiet Operation, Uniform Heat Distribution through Register, and Durability.

SIZES—The John Zink Floor Furnace is built in four sizes—the input ratings are 25,000 B. t. u., 35,000 B.t.u., 50,000 B. t. u. and 68,000 B. t. u.



The One Port Floor Furnace

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UNIT HEATERS for Commercial and Industrial Space Heating

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New York - Los Angeles - Detroit - San Francisco - St. Louis

MEETINGS & CONVENTIONS

Welding Society

American Welding Society, 25th annual meeting, October 16-19, Hotel Cleveland, Cleveland, Ohio, in conjunction with the National Metal Conference at the Hotel Statler in Cleveland. A session on piping and pressure vessels is scheduled for Wednesday afternoon, October 18, with papers on pressure vessel welding, by Edward B. McGuire, Hamler Boiler & Tank Co.; normalizing of welds in carbon-molybdenum steel pipe by 60 cycle induction heating, by I. A. Rohrig and D. H. Corey, The Detroit Edison Co.; welding of dissimilar metals, by E. C. Chapman and R. E. Lorentz, Combustion Engineering Co.; and oxy-acetylene pressure welding, by A. R. Lytle, Union Carbide & Carbon Research Laboratories.

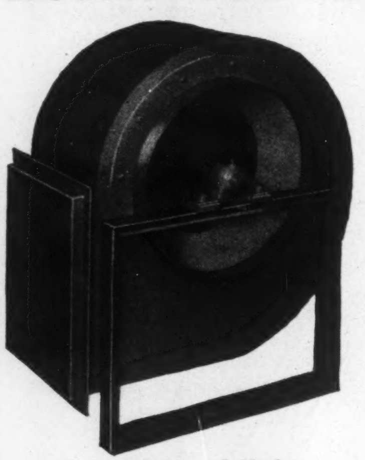
Supply Association and Heating Bureau

Central Supply Association, annual fall convention, October 26-27, Palmer House, Chicago, Ill. Dinner to be given Thursday evening, October 26, in honor of the 25th anniversary of the founding of the Plumbing and Heating Industries Bureau. Walter Reichle is president of the CSA, and Harry F. Beglen is president of the bureau.

Industrial Hygienists

Industrial Hygiene Foundation, ninth annual meeting, November 15-16, Mellon Institute, Pittsburgh, Pa.

"GENERAL" MULTIBLADE EXHAUSTERS



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The program will consider sickness in industry and problems connected with sick absenteeism which call for postwar solutions, and there will be a panel on putting disabled veterans back to work. The headquarters office of the foundation is at 4400 Fifth Ave., Pittsburgh 13, Pa.

Chemical Exposition and Conference

National Chemical Exposition, November 15-19, Chicago Coliseum, 15th and Wabash, sponsored by the Chicago section of the American Chemical Society. Marcus W. Hinson, 330 S. Wells St., Chicago 6, Ill., is the exposition manager. A feature of the show will be the National Industrial Chemical Conference.

Power and Mechanical Engineering Show

National Exposition of Power and Mechanical Engineering, November 27-December 2, Madison Square Garden, New York, N. Y. Apparatus for production, control, distribution, and transmission of heat and power to be featured. Charles F. Roth, president of the International Exposition Co., is manager of the show. Headquarters office is at 480 Lexington Ave., New York 17, N. Y.

Heating and Ventilating Engineers

American Society of Heating and Ventilating Engineers, 51st annual meeting, January 22-24, Hotel Statler, Boston, Mass. For details, see ASHVE Journal Section in this issue. The secretary of the ASHVE is A. V. Hutchinson, 51 Madison Ave., New York 10, N. Y.

AIR CONDITIONING NOZZLES

Nozzles of unique Yarway Involute Design.

No internal parts or vanes to clog or erode.

Insure trouble-free air washing service.

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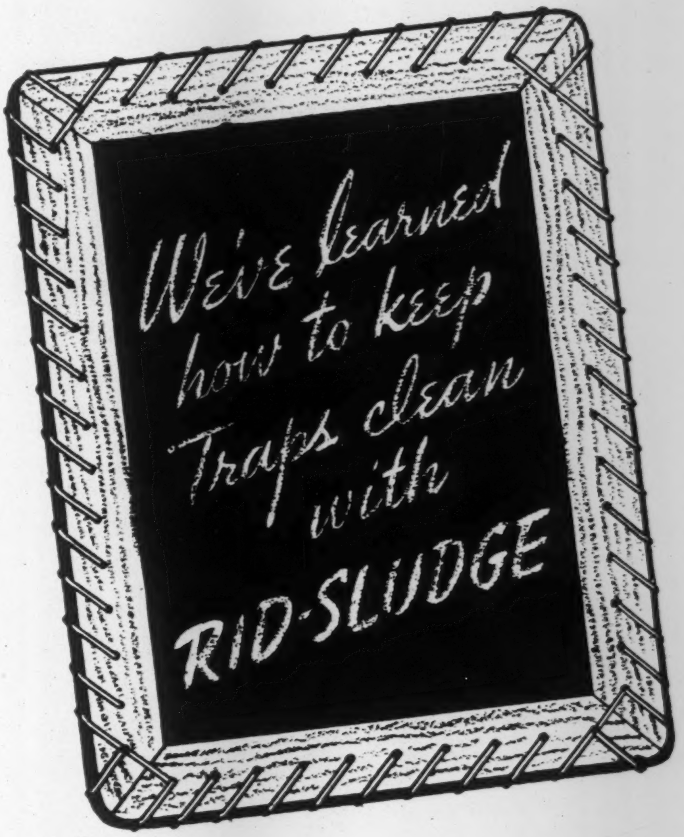
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SLUDGE, oil, light lime, grease. silt and boiler carryover are present in every heating system. They tear down heating efficiency, boost fuel costs and complaints. There is one way to rid your heating system of sludge and other efficiency destroying deposits. The scientific Rid-Sludge treatment will clean out all dirt in traps, radiators, valves, pipes—the complete heating system—and restore new efficiency to the heating plant.

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ALLEN "FLIES" THE DUST LOAD OUT OF THIS FOUNDRY BUILDING!

..a Typical Assignment for Allen Engineers

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Result: Atmospheric dust count was reduced to a point well within the limits necessary for the maintenance of an hygienic atmosphere. Allen men have the right attitude toward ventilating problems. They look with complete realism on the problem and are free to recommend the right course. *The Allen Corporation, 9751 Erwin Avenue, Detroit 13, Michigan.*

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ENGINEERED VENTILATION FOR INDUSTRY

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For your convenience in obtaining copies of these bulletins, see coupon on page 147. If you write direct to the manufacturer, describe carefully what literature you want, as the number given first in each item is for use only when sending in your request to Heating, Piping & Air Conditioning.

Air Conditioning Plans

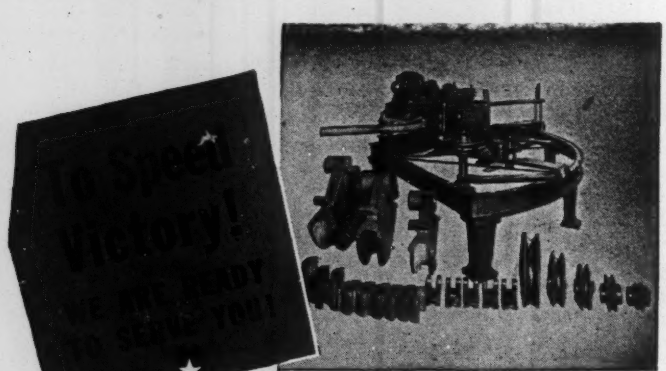
No. 4794—16 p. booklet on how to plan postwar air conditioning today, describing the functions of air conditioning, why it is essential for business success, discussing important considerations in fitting air conditioning to particular needs, and illustrating the manufacturer's equipment.—Westinghouse Electric Elevator Co., Jersey City, N. J.

Air Operated Controllers

No. 4795—8 p. bulletin (A115) describing new line of air operated controllers for temperature, pressure, humidity, vacuum, liquid level, and flow.—Bristol Co., P. O. Box 1790, Waterbury 91, Conn.

Air Washers

No. 4796—4 p. bulletin (205) on the manufacturer's "air scrubber," an air washer containing no spray nozzles and not requiring extensive piping and designed for cleaning, humidifying, dehumidifying, cooling, and fume elimination. Capacities range from 1000



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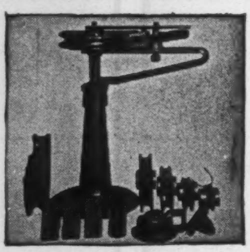

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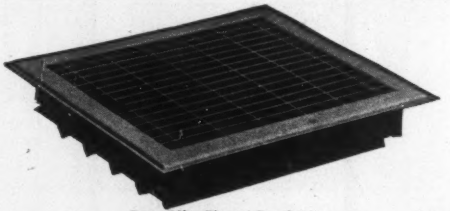

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- ★ Cross-locked assembly for surplus strength and rigidity.
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& GRILLES · for Air Conditioning and Gravity

to 100,000 cfm.—J. O. Ross Engineering Corp., 350 Madison Ave., New York 17, N. Y.

Calculator for Water Flow in Pipes

No. 4797—Universal calculator for flow of water in pipes, designed by T. Francis O'Connor "to show simultaneously all hydraulic factors usually required in water works problems" and giving readings for length and size of pipe, pipe coefficient, flow and velocity, and pressure loss in pounds and in feet.—Grinnell Co., Inc., 260 W. Exchange St., Providence 1, R. I.

Conduit Systems for Pipe Lines

No. 4798—12 p. bulletin (44) on conduit systems for underground and overhead steam, oil, or hot water lines, with sections on prefabricated insulated pipe units, expansion loops, tile and cast iron conduit, and oil or process liquid piping. Specifications and engineering data are included.—Ric-wiL Co., 1562 Union Commerce Bldg., Cleveland 14, Ohio.

Controls

No. 4799—General catalog (C-4) of control equipment for the water works and sewage disposal industry, with sections on elevated tank control, hydropneumatic systems, float operated control, and accessories.—Automatic Control Co. of Minnesota, 1005 University Ave., St. Paul 4, Minn.

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No. 4800—4 p. bulletin (213) on "Vernatherm" temperature operated controls for fluid control valves,

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HOW DIRTY ARE YOUR FILTERS?
THIS GAGE TELLS

HAYS AIR-FILTER GAGE

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If you are confronted with the problem of not knowing when the collected dirt in your filters is of sufficient density to decrease operating efficiency, install a HAYS Air-Filter Gage. The HAYS indicator shows amount of air resistance at all times—tells when to renew filter element—eliminates guess work—can be made to sound alarm when resistance is excessive. Write for full information. Ask for HAYS Bulletin A-F G.

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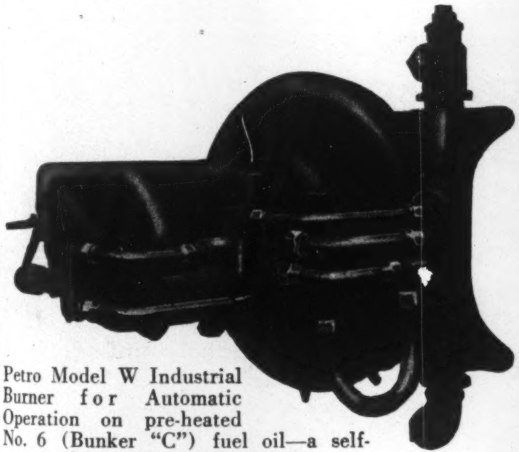

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Cut Steam Costs — ***for reasons familiar to good heating men — such practical reasons as:***

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Capacities—to 145 gallons per hour—454 Boiler h.p.—68,000 Sq. Ft. Steam

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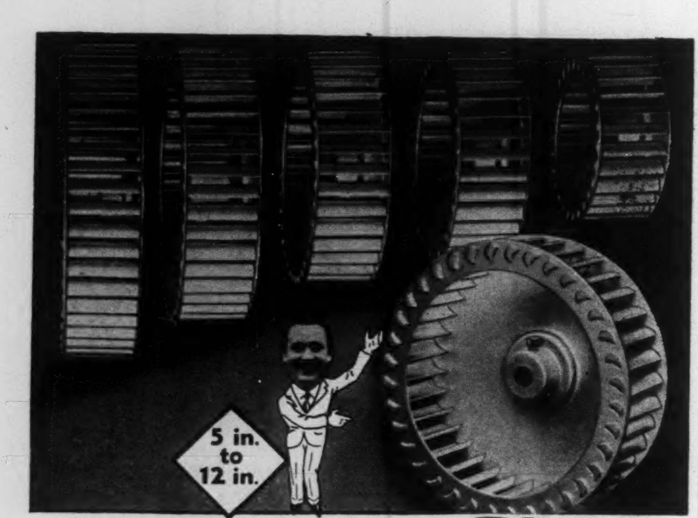

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ALL MARTOCELLO SPRAY NOZZLES are manufactured with precision and of a design which has been thoroughly tested for maximum results and durability. They are guaranteed to give satisfaction. Successful, efficient results depend largely upon selecting the proper number, type and size of Nozzles suitable for your installation.

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mechanical linkages, shutters, etc., describing principle of operation and applications.—Detroit Lubricator Co., 5900 Trumbull Ave., Detroit 8, Mich.

Decarbonators

No. 4801—4 p. bulletin (2975) describing decarbonators for removing certain dissolved gases from water solution.—Cochrane Corp., 3131 N. 17th, Philadelphia 32, Pa.

Evaporative Condensers

No. 4802—16 p. bulletin (3B) on "d-h Wat-R-Miser" evaporative condensers, equipped with built-in air filters, giving detailed information on features and construction, with dimension and selection tables and other engineering data.—Drayer-Hanson, Inc., 738 E. Pico Blvd., Los Angeles 21, Calif.

Flow Meters

No. 4803—8 p. bulletin (349) on "Shuntflo" meters for steam, air and gas, with complete information on construction and operation.—Builders-Providence, Inc., Div. of Builders Iron Foundry, 9 Codding St., Providence 1, R. I.

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No. 4804—Three data sheets showing roughed-in drawings, dimensions, and input and output ratings for propeller fan, blower, and duct type gas fired unit heaters.—Reznor Mfg. Co., Mercer, Pa.

Heating System Control

No. 4805—12 p. catalog bulletin (396) on electronic "Duo-Stat" control for heating systems in commercial,

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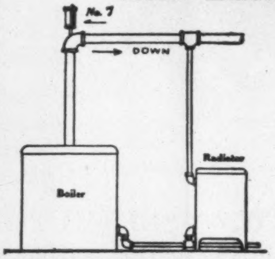

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Don't fight air pockets or traps in hot or cold circulating lines? "Get that air out of there" *and keep it out* simply by installing the No. 7 Maid-O'-Mist Automatic Air Vent. This reliable air vent has a self-closing float-controlled valve and is designed especially for circulating pipe lines, convector radiators, unit heaters, cooling manifolds, tanks, diesel engines, or any other application where air pockets or traps retard the free circulation of liquids. Now available in bright brass finish.

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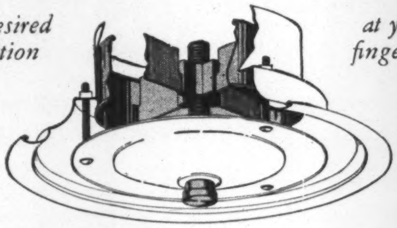

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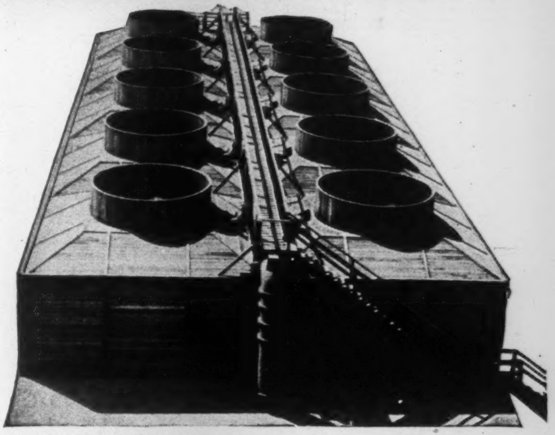

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Construction Features: Independent operation of individual, or cell groups. Motors located out of air stream. Redwood discharge stacks prevent recirculation.

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Large active grate area. No dead plates! Hopper and Bin Feed Models. 200 to 850 lb. per hour.

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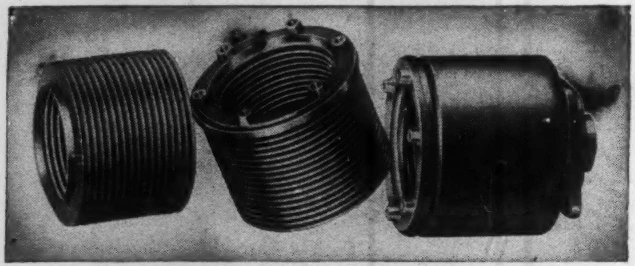

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Heat Resistant Coatings

No. 4806—2 p. bulletin (925) on "White Hot" and "Pyro-Chrome" heat resistant coatings for protection of refractories, metals, ceramics, etc.—Preferred Utilities Mfg. Corp., 1860 Broadway, New York 23, N. Y.

Ice Making Equipment

No. 4807—32 p. bulletin (127-G) on ice making equipment, with detailed information, photographs, and drawings of each of the parts which go to make up the complete plant.—Frick Co., Waynesboro, Pa.

Painting Radiators

No. 4808—Issue of Paint Progress (Vol. 5, No. 2) with article on painting radiators and information on effect of paint on radiator performance.—New Jersey Zinc Co., 160 Front St., New York 7, N. Y.

Plastic Coatings

No. 4809—16 p. bulletin on "Amercoat" plastic coatings for protection of process equipment against corrosion or contamination.—Amercoat Div., American Pipe and Construction Co., P. O. Box 3428, Terminal Annex, Los Angeles 54, Calif.

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APCO TURBINE-TYPE PUMPS—the simplest of all pumps. Ideal for small capacity, high head duties. Silent, compact and lasting.

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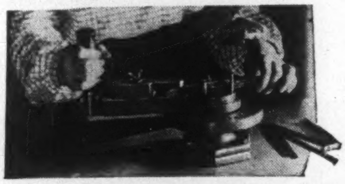

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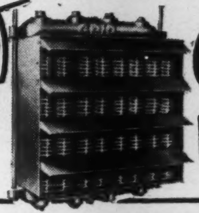
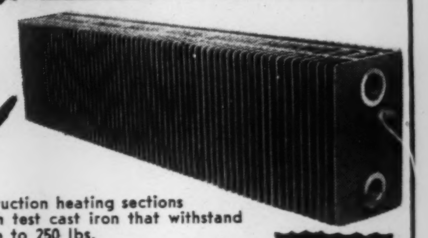
DI-ACRO

O'NEIL-IRWIN MFG. CO.
313 EIGHTH AVENUE SOUTH • MINNEAPOLIS 15, MINNESOTA

1931 1934 1936 8-10-13 YEARS CONTINUOUS SERVICE WITHOUT MAINTENANCE Thats GRID UNIT HEATER





and here's why!

- One-piece construction heating sections (patented) of high test cast iron that withstand steam pressures up to 250 lbs.
- No soldered, brazed, welded or expanded connections to become loose or develop leaks.
- No electrolysis to cause corrosion, breakdowns, leaks, or heating failures.

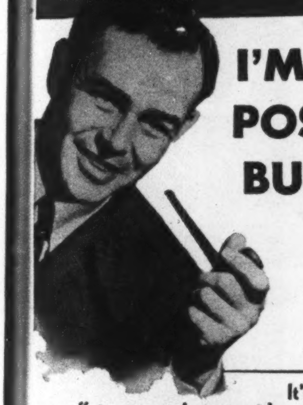
HIGH TEST Cast Iron HEATING SECTIONS

Is it any wonder that GRID Unit Heaters outlast other types of heating equipment, without maintenance expense? They are built to last, as is proven by the many plants that have operated them continuously for as many as 13 years.

Install GRID Unit Heaters for permanency. Complete data and capacity tables upon request.

GRID

D. J. MURRAY MANUFACTURING CO.
Wausau, Wisconsin



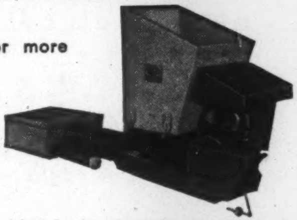
I'M BUILDING MY POSTWAR STOKER BUSINESS TODAY!

A lot of smart dealers are doing just that—selling the unrestricted models to office buildings, hospitals, schools, churches, hotels, using 25 tons or more of coal per season ... and at the same time storing up ideas and prospects for tomorrow when smaller models will be released.

It's a fine time to start, and you will be off to a good start with

GEHL STOKERS

- Engineered to do a better job for more years by a 77-year-old company.
- Established consumer acceptance.
- All-cast chassis that resists rust and corrosion.
- Barometric, automatic control of chimney draft, and many other advantages that make sales and satisfied customers.

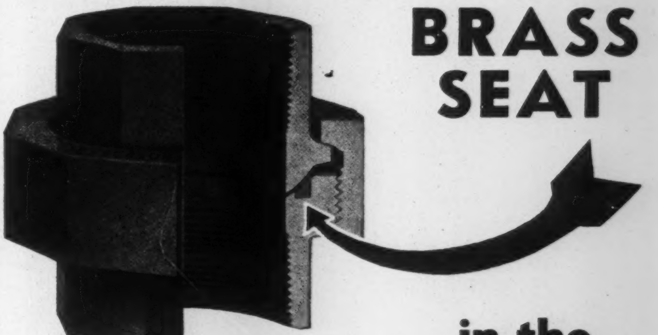


Models for factories, warehouses, public buildings, office buildings, apartment buildings, schools and churches.

WRITE TODAY for literature and dealer plan. Be ready for the big postwar demand.

GEHL BROS. MFG. CO.
Established 1867 Dept. BK-843 West Bend, Wisconsin
A GEHL WINS FRIENDS WHEREVER IT GOES

The RECESSED BRASS SEAT



in the JEFFERSON UNION

is cut from seamless drawn tubing —free from all casting defects— sound and uniform always!

JEFFERSON UNION CO.
601 West 26th Street, New York 1, N. Y.
Factories at
Lexington 73, Mass. Lockport, N. Y.

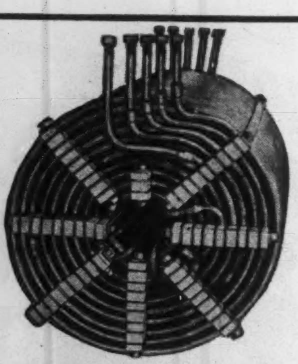
Subatmospheric Steam Heating

No. 4810—24 p. brochure (632) on High-Altitude Heating for Buildings, comprising an interesting and educational explanation of subatmospheric steam heating, describing the functions of the manufacturer's differential equipment, the method of control, and with pictures and some performance data on an impressive array of buildings heated by this method.—C. A. Dunham Co., 450 E. Ohio St., Chicago 11, Ill.

Welding Symbols

No. 4811—Wall chart illustrating the welding symbols recommended as standard by the American Welding Society and showing the symbols for fusion welding and for resistance welding.—Hobart Brothers Co., Troy 1, Ohio.

INTO THIS COIL ➡ WE BENT half a mile of COPPER TUBING



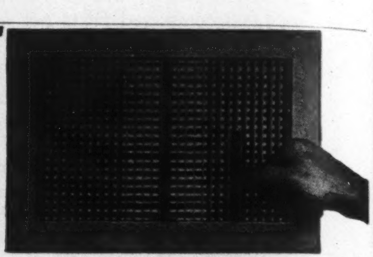
Here's a job typical of Swan's skill in precision pipe and tube bending. A certain naval condenser unit takes a lot of copper tubing—two tons of it! *Half a mile of it!* To be bent into a coil no bigger than a small clothes closet. Thermal requirements for maximum efficiency of the unit make necessary the placement of the coil surfaces with great precision in all three dimensions.

Swan Engineering did it!
And in quantity!
And on time!

Use our advisory engineering service in connection with your bending problems. Swan Engineering will quote promptly on bending jobs large or small, simple or complicated, in any of the usual metals or alloys including stainless steel and aluminum. *Send your bending to Swan!*

SWAN ENGINEERING COMPANY, Inc.
746 Frelinghuysen Ave. Newark 5, N. J.

DOUBLE ADJUSTABLE GRILLES



Design 5050VA—Made in all Standard Sizes; special sizes made to order. Vertical bars on face are adjustable in groups; horizontal bars on back are similarly adjustable. Back louvres can be adjusted from face. Allows vertical deflection of air to right or left from straight flow to 45 degrees right and 45 degrees left; horizontal deflection upward or downward from straight flow to 45 degrees either direction.

FOR PRODUCTION SPEED-UP—
Specify Precision Processed STANFORATED Perforations. Industrial Screens, Filters, Guards, etc., made to specifications for vital industries. Handy catalog sent on request.

STANFORATED

STANDARD STAMPING & PERFORATING CO.
3151 W. 49th PLACE · CHICAGO, ILLINOIS

GET RID of WELDING FUMES!

The powerful suction created by Ruemelin Fume Collectors draws out noxious gases, smoke and heat *at the source*. *Cleans shop air with minimum loss of building heat*. Covers maximum territory. Guards employee health. More than 1,000 serving war plants all over the nation. Shipped completely assembled, easy to install.

Write for Bulletin 37-C

RUEMELIN MFG. CO., 3896 N. Palmer St., Milwaukee 12, Wis.

RUEMELIN FUME COLLECTOR

A 4275-¼A

Famous **FIRE-GUARD** *Automatic Coal Stokers have* **EVERYTHING** *you want*

DEPENDABLE built to serve.
DURABLE . . . built to last.
PROTECTED against overloading or foreign matter in fuel.
ACCESSIBLE ...easy to inspect working parts.
EFFICIENT ...engineered to get the most from your fuel.
TAILORED . . . to any load.-Industrial Sizes from 70 to 400 pounds per hour Capacity Variable speeds.
PROVEN . . . by thousands of users everywhere.

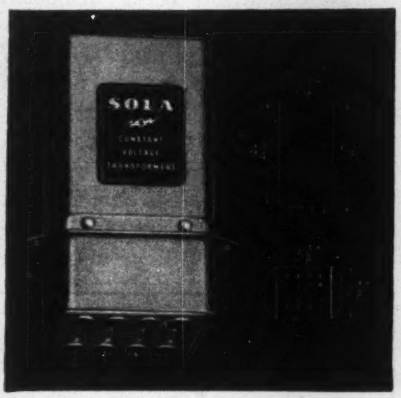
NOW AVAILABLE
Wire, Phone Or Write For Full Details

PEERLESS
MANUFACTURING CORP.
INCORPORATED
LOUISVILLE, KENTUCKY

EQUIPMENT DEVELOPMENTS

For your convenience in obtaining more information about any of this equipment, see coupon on this page. Add the new products and companies listed here to your Directory Section which you received in your January 1944 Heating, Piping & Air Conditioning and thus keep your records of sources of supply up to date throughout the year. Single asterisk indicates equipment not listed in Directory Section; double asterisk equipment and manufacturer not listed.

Constant Voltage Transformer for Controls

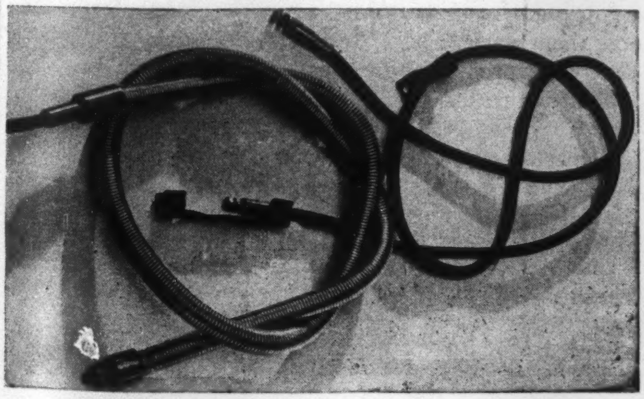


No. 2714**—The small, compact, hermetically sealed, constant voltage transformer illustrated has been designed for such applications as heating and refrigeration controls, television and FM receivers, vacuum tube voltmeters, electronic gaging and inspection equipment, photometric instruments, and other similar applications where precisely regulated supply voltage is mandatory, according to the manufacturer's announcement. At any reasonable transformation ratio of input to output it will provide a single output voltage constant to within ± 1 per cent of rated requirements regardless of line voltage variations as great as ± 12 to 15 per cent, it is stated. Capacities up to 15 VA, 60 cycle operation are available and are supplied with a separate capacitor unit for external mounting. This transformer has no moving parts, requires no manual supervision or adjustments, and is said to be self-protecting against short circuit.—Sola Electric Co., 2525 Clybourn Ave., Chicago 14, Ill.

Flexible Electric Heat Unit

No. 2715**—A flexible, "serpentine" electric heat unit can be coiled in close or in widely spaced turns around pipes and cylinders, spiraled around molds, or fitted to odd contours.

Of metal and ceramic construction, it can be made in varying lengths and diameters and in capacities upwardly to 15-20 watts per lineal inch. Exact temperatures up to 1000 F can be maintained without deterioration of the steel-ceramic structure, the maker states.

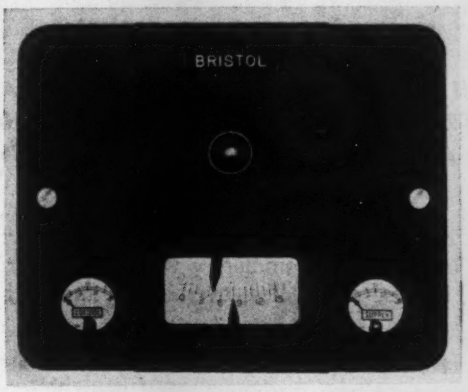


Heat may be applied through direct contact of the unit or may be transferred through clips or fixtures of various designs. The unit may be left exposed or may be sealed or coated over with insulating cement.

Applications already have been designed for de-icing installations on airplane engine nacelles, and on hangar doors; also on molds where critical temperatures must be maintained, and on melting pots of unusual shapes. Other applications include the heating of pipes and valves carrying viscous fluids. Experimental work is being done on various applications in the plastic field.—H. & A. Mfg. Co., Inc., Buffalo, N. Y.

Air Operated Control Instruments

No. 2716—A new series of indicating, air operated control instruments, known as the "Model 93" series, are built for controlling temperature, pressure, vacuum, liquid level, and humidity. They operate on the free vane principle of automatic control, and have a throttling range of from ½ to 15 per cent with the adjusting mechanism arranged so that changes in the throttling range can be made by the user without the need of tools.



These controllers are direct set instruments that can be set to control at any value within the range of the instrument by turning the control pointer to the desired value. They are built so that they can be changed by a

Heating, Piping & Air Conditioning, [11-44]
6 N. Michigan Ave., Chicago 2, Ill.

Please ask the manufacturers to send me more information about the equipment mentioned under the following reference numbers in Equipment Developments and Recent Trade Literature.

(Circle each number in which you are interested)

2714 2715 2716 2717 2718 2719 2720 2721 2722 272
2724 2725 2726 2727 2728 2729 2730 2731 2732 273
2734
4812 4813 4814 4815 4816 4817 4818 4819 4820 4821
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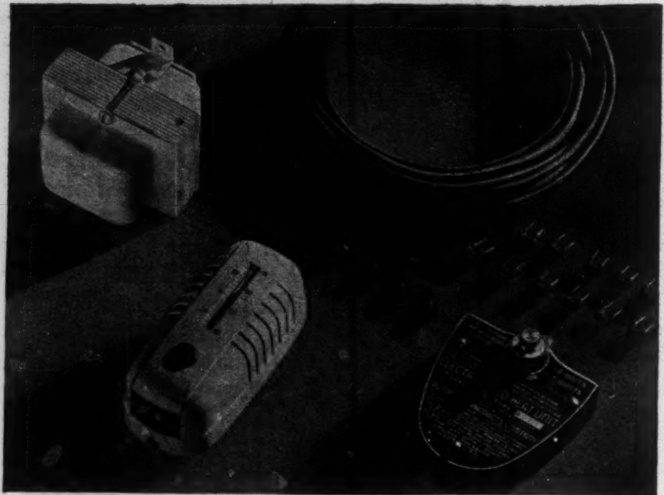
4832 4833 4834 4835

Name ....Title............
Company ....
Address ....
City ....State..........



FUEL OIL CONSERVATION Offers YOU New SALES OPPORTUNITIES

Install A-P THERMOSTATIC TEMPERATURE CONTROLS on ALL Oil Burning Space Heaters using A-P Model 240-DR or UR Manual Controls

Unless you show them how to get *more* heat, *more* steady comfort out of available fuel oil, many space heater users in your community will be cold early next spring, because of needless overheating and fuel waste.

Here's your chance to make many staunch friends, an opportunity to serve — and SELL. Get in touch with all your past heater customers. Tell them how the addition of an A-P THERMOSTATIC TEMPERATURE CONTROL SET to their present heater will help stretch fuel oil enough to take them over the "hump."

Complete Sales Package — Easy to Install

The A-P Thermostatic Temperature Control Set is a complete sales package, including an Electric Auto-Heat Conversion Top for installing on top of present manual controls, an accurate wall thermostat, transformer, wiring, staples and full instructions. It's easy and simple to install on most oil burning space heaters, inexpensive, more than pays its cost in fuel savings and steadier comfort. *No priorities needed.*

Tie in NOW on this vitally essential program — for ready extra sales! Write for bulletin and prices on A-P Thermostatic Temperature Control Set No. 240-ED.

AUTOMATIC PRODUCTS COMPANY

2460 NORTH 32nd STREET
MILWAUKEE 10, WISCONSIN

Fuel-Saving Starts With CONTROL

DEPENDABLE
OIL CONTROL VALVES

finger adjustment from reverse to direct action or vice versa.

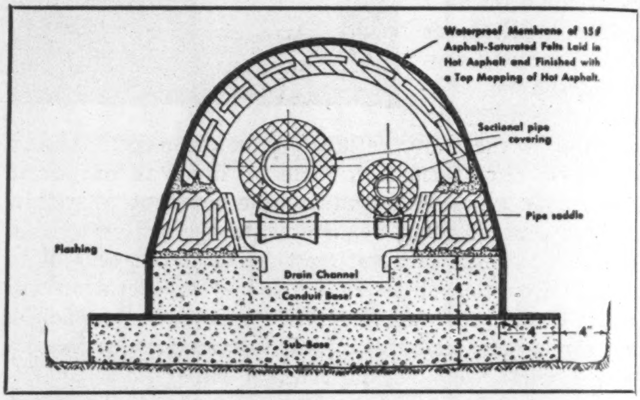
Typical applications include control of temperatures in bake ovens, drying ovens, cookers, retorts, plating tanks, and soft metal pots and the control of steam pressure, pressure in retorts, and back pressure on digesters.—Bristol Co., P. O. Box 1790, Waterbury 91, Conn.

Making Underground Pipe Conduits Waterproof for Submerged Conditions

No. 2717—The modified design of underground pipe conduit shown in the accompanying sketch is used in exceedingly wet or submerged locations where it has proved entirely successful in keeping out all traces of moisture, says the manufacturer.

Dry insulation is of utmost importance in underground pipe conduits, particularly those conduits that carry steam and refrigeration. Wet insulation is about as good as no insulation at all. The standard "Therm-O-Tile" design is employed, with its internal drain, so that in the event of condensation of moisture out of the air within the conduit, it can be drained out by means of the drain channel shown in the sketch.

The standard design performs satisfactorily for ordinary usage, according to the announcement, but for unusual moisture conditions such as partial or full submergence, the modified design shown here is recommended by the maker.



Waterproof Membrane of 15# Asphalt-Saturated Felts Laid in Hot Asphalt and Finished with a Top Mopping of Hot Asphalt.
Sectional pipe covering
Pipe saddle
Flashing
Drain Channel
Conduit Base
4"
Sub-Base
3
4"
4"

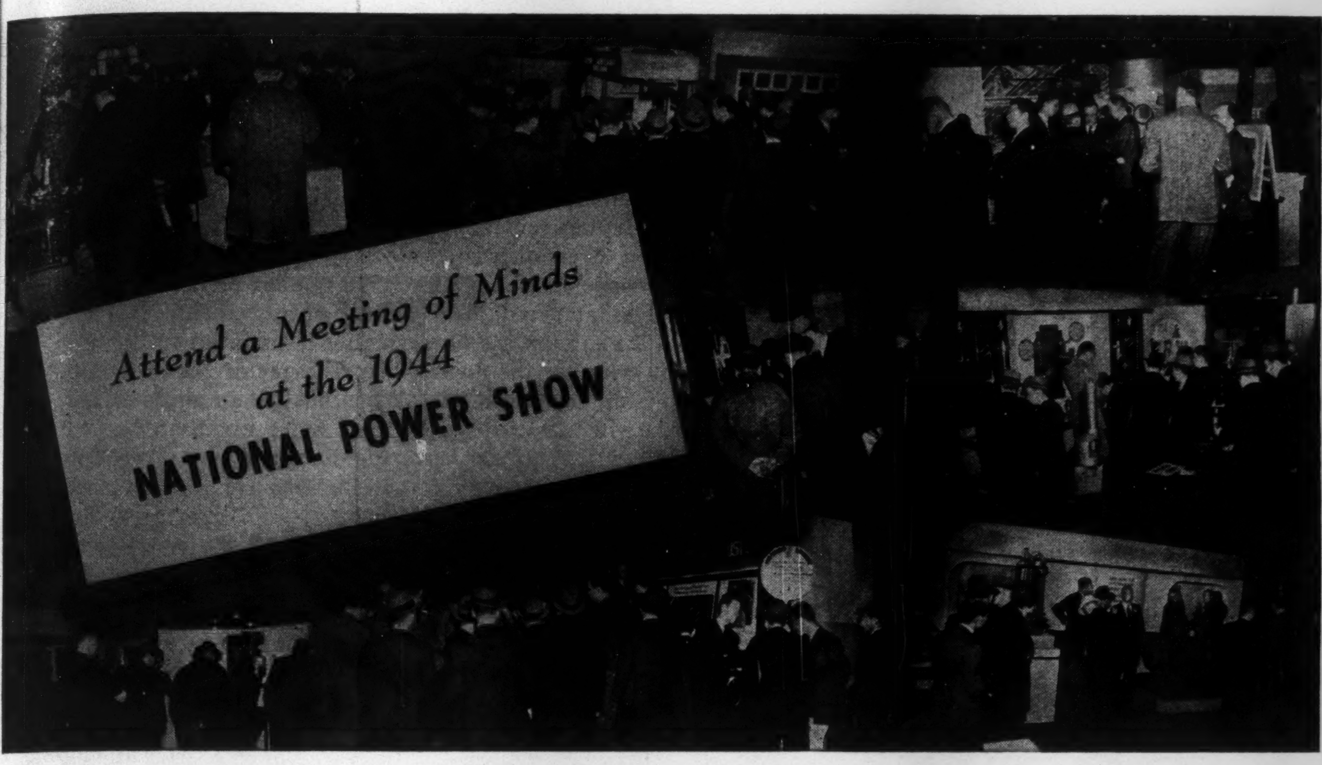
It will be noted that in this design there is a wide sub-base beneath the standard spread footing foundation. The sub-base is wider for two reasons: (1) to reduce foundation unit pressure, and primarily (2) to simplify the mechanics of joining the waterproofing membranes so that leakage will be impossible.

What the modified design really amounts to is this: The standard design is hermetically sealed by surrounding the entire conduit with a membrane waterproofing and then placing it on top of the additional sub-base. The waterproof membrane usually consists of 15 lb asphalt-saturated felts laid in hot asphalt and finished with a top mopping of hot asphalt.

Sometimes the wet supporting soil is not sufficiently solid even for this extra wide sub-base, in which event the sub-base is made to rest on driven piling.—H. W. Porter & Co., 825 Frelinghuysen Ave., Newark, N. J.

Portable Air Duct

No. 2718—To meet wartime needs, a new type of portable air duct—flexible but noncollapsible—has been



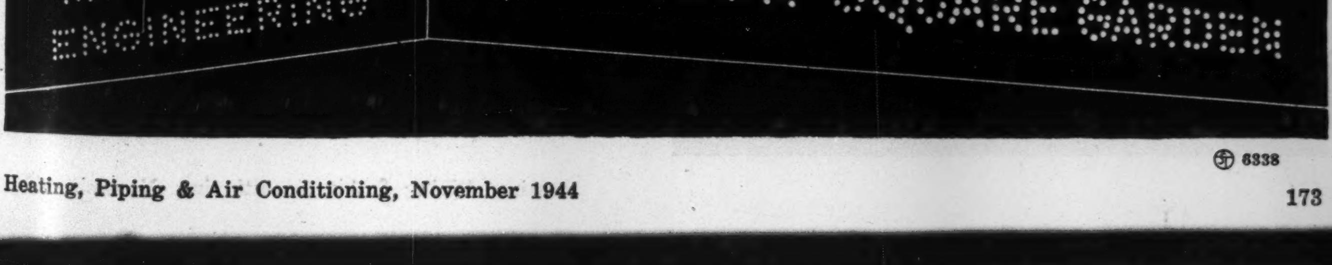
Gather timely essential ideas on power maintenance and conservation!

You can attend a huge pooling of practical, tested ways and means of maintaining and using the power load which "backs the attack"—at the 16th National Exposition of Power and Mechanical Engineering. There, engineers and executives concerned with the efficient operation, production, transmission and utilization of power, can get first-hand help on the special problems of 1944—and 1945. Engineering specialists in attendance at scores of thought-stimulating exhibits, will furnish latest advice on the use and maintenance of their equipment. Displayed also will be exhibits of tools for various power production and maintenance uses.

Sharpen your plans for needed post-war equipment and methods

This show can provide an ideal opportunity for you to check your thinking on the problems of modernization and transition to peacetime economy . . . rebuilding after Victory. You can see many new products—some of them available for the first time . . . discuss new developments that will affect power plant operation . . . decide on their practicability for your needs. You can obtain direct answers to many questions — answers which may shape your future plans sharper and clearer.

Plan to attend the National Power Show this year, with as many of your associates as can be benefited. See for yourself the many interesting and informative exhibits. Exchange up-to-the-minute experiences with other power engineers. Take back to your job a new and revitalized outlook.



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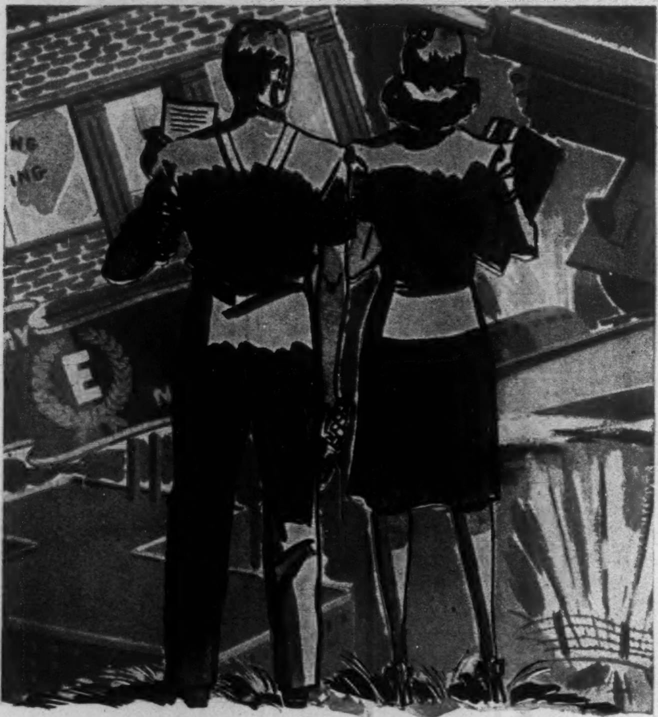


BOTH... are important

1—PROTECTING AMERICA WITH VITAL FIGHTING EQUIPMENT.

2—SERVING YOU AND THE NATION WITH ESSENTIAL PLUMBING AND HEATING MATERIALS.

BOTH have been duties we have tried to fulfill—with utmost diligence.

In the most urgent of these duties, we are proud of having won the coveted Army-Navy "E"—proof of a job well done.

In the other duty, we like to feel that our wartime efforts for the trade might be worthy of a similar award—if there were such a thing as an "E" from the trade.

While producing fighting equipment for 4 of the 5 major war procurement groups, we have managed also to supply a lot of Victory and normal materials for the home front through you.

To accomplish both these important objectives, our plant, our equipment, our personnel, and all facilities have had to be expanded manyfold. Our only regret is that even with this it has been impossible for us to supply more than a fraction of the Schaible materials our customers want and need. This tempers our satisfaction and pride in our honors from Uncle Sam.

But better days are near. And until then, your needs are of course second only to urgent war needs—and that, we know, is the way you want it. Victory first!

THE MEN AND WOMEN OF
The Schaible Company
CINCINNATI 4, OHIO

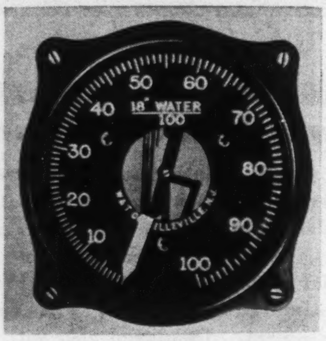
MAKERS OF QUALITY BRASS GOODS STOCKED BY LEADING WHOLESALERS EVERYWHERE

developed for either blower or exhaust systems. It is an improved "Ventube" flexible ventilating duct designed primarily for auxiliary ventilation in ship construction, loading and unloading, cleaning or repairing ships. It also is suitable for other industrial uses such as building and maintenance of vats, tanks, tank cars, boilers, or for rapidly changing air in workrooms or drying rooms.

It comprises a sleeve or tube of standard "Ventube" impregnated cloth, either regular or fire resistant, with a tempered steel helical spring inside it. Thus the maximum air flow opening is maintained, regardless of whether the duct is bent sharply or the system is blowing or sucking air. When bent to an angle of 180 deg it will exhaust eight times more air than the old style tubing. If the covering is burned by a welding torch or cut through it can be patched like an automobile inner tube.—E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

Low Pressure Precision Gage

No. 2719*—A precision low pressure gage designed for exactly measuring critical low air pressure, and suitable for measuring pressure of other gases or liquids, has a sensitivity of one part in 500, says the manufacturer, and an accuracy of one part in 300. The dial is 2¾ in. in diameter, and covers 300 deg, thus providing a scale length of about 7 in. Dials are individually calibrated for each instrument and furnished to read any desired pressure equivalent.



Gages can be constructed with an expanded scale at the lower pressures and a contracted scale at the higher pressures. A combination gage measuring both vacuum and pressure is available.

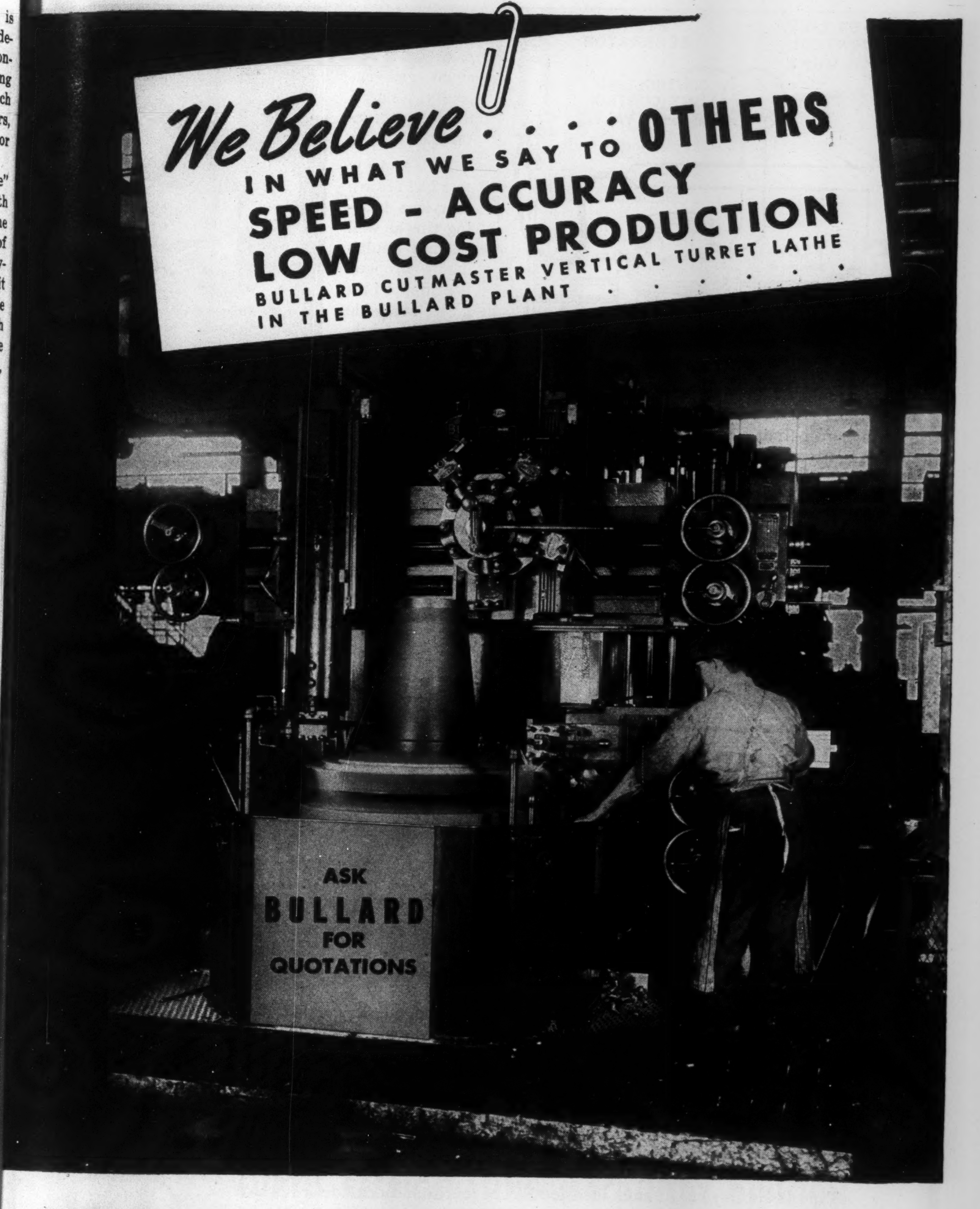
The pressure sensitive element is comprised of a number of beryllium copper capsules connected in series.—Wallace & Tiernan Products, Inc., Belleville 9, N. J.

Safeguard Against Temperature Over-Runs

No. 2720—An over-run of temperature can be costly on many industrial and commercial control systems, such as banana room heaters, deep fat fryers, fish meal dryers, core ovens, chicken brooders, water heaters, etc. A way to safeguard against this hazard and waste consists of installing an additional limit control and a manual reset valve.

To illustrate—says the manufacturer—if the control system pictured was on a deep fat fryer, the controlling limit control for the B-60 valve would be set at 380 F. The over limit control for the MR-2 manual reset valve would be set below the flash point of grease or about 410 F. Then, should pipe scale or dirt lodge underneath the main controlling valve seat, the second shutoff control would prevent the fryer temperature from rising to the flash point.

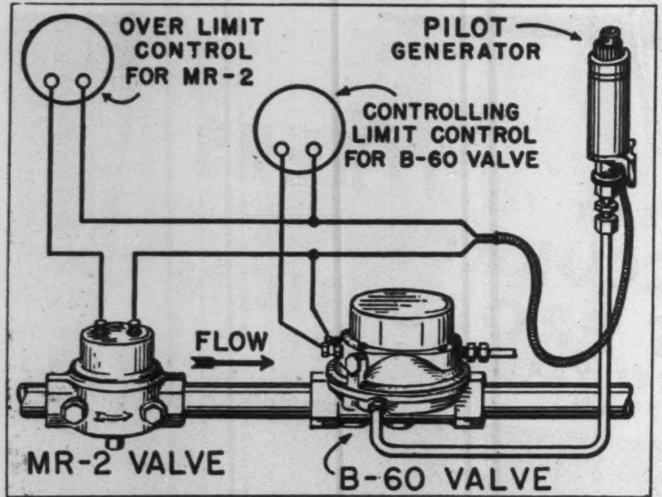
In normal operation, the MR-2 is initially set by hand



We Believe . . . . OTHERS
IN WHAT WE SAY TO
SPEED - ACCURACY
LOW COST PRODUCTION
BULLARD CUTMASTER VERTICAL TURRET LATHE
IN THE BULLARD PLANT . . . .

ASK
BULLARD
FOR
QUOTATIONS

THE BULLARD COMPANY
BRIDGEPORT 2, CONNECTICUT, U.S.A.


OVER LIMIT CONTROL FOR MR-2
PILOT GENERATOR
CONTROLLING LIMIT CONTROL FOR B-60 VALVE
FLOW
MR-2 VALVE
B-60 VALVE

upon lighting the pilot burner, after which the controlling limit control will turn the B-60 on or off according to heat requirements. Should temperature rise above normal, over-limit control releases the MR-2 until operator can attend to heater.—General Controls Co., 801 Allen Ave., Glendale, Calif.

Heating Torch With Multiflame Tips

No. 2721—A new medium weight heating torch is especially designed for concentrated localized heating such as is required for bending, straightening, and shrinking of steel plate as well as for silver brazing of heavy copper plate in the manufacture of copper pipe. The torch is lighter in weight than heating torches that have been available in the past, yet it has equal gas capacity, says the manufacturer.

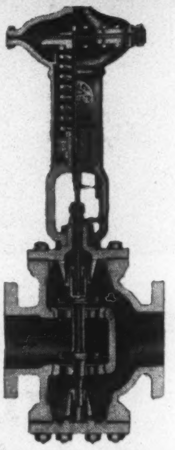
Five new multiflame acetylene heating tips as well as two multiflame propane heating tips are available for this torch. These seven tips will meet the requirements of every heavy heating job, it is stated.

Three mixers are available for the torch, viz., for positive pressure acetylene, low pressure acetylene, and for propane. The available extensions include a 12 in. straight extension and 18, 24, and 42 in. angular extensions.—Air Reduction Sales Co., 60 E. 42nd St., New York 17, N. Y.

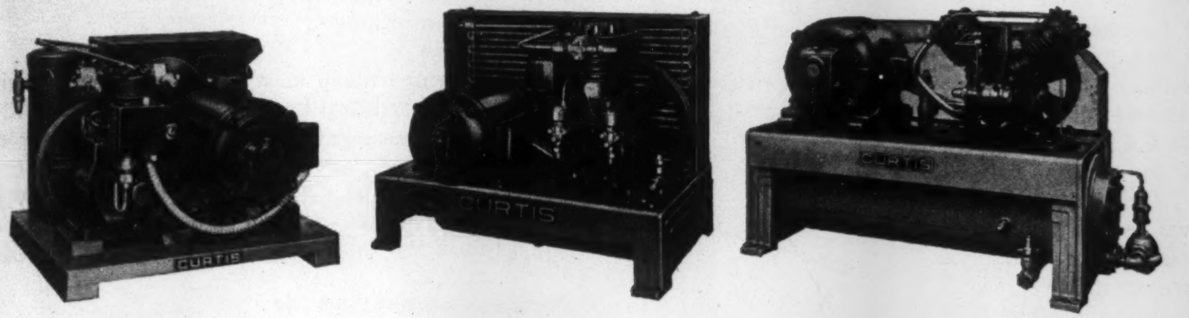
THE YEAR THE UTES RAISED MERRY NED

THE INDIAN uprising at White River in the new state of Colorado was unexpected. Hostilities were fierce—but quickly quelled. That was 1879, the same year Kieley & Mueller introduced the steam trap. This too, was unexpected—an entirely new idea—the "daddy" of all traps. Control equipment has come a long way since 1879. Witness the K & M Diaphragm Motor Valve, for supersensitive pressure control of steam, oils, liquids, gas or air. Designed for use with air-operated instruments or auxiliary pilot units —in models to meet every condition of flow, pressure and temperature. Patented special features assure minimum friction lag and maximum efficiency. Type 484 is only one of more than 100 K & M precision control devices which benefit from our 64 years of specialization. Write for general Catalog No. 66.

KIELEY & MUELLER, INC.
MANUFACTURERS OF PRESSURE AND LEVEL CONTROLS SINCE 1879
NORTH BERGEN, NEW JERSEY



Food Is Vital in the Fight for Freedom



½ hp. Air-cooled Condensing Unit

1½ hp. Air-cooled Condensing Unit

15-ton Water-cooled (Shell and Tube Type) Condensing Unit

CURTIS REFRIGERATION Prevents Spoilage and Waste

★ The Nation's food supply is a grave factor in War, it is vital to Victory. Its conservation and preservation by mechanical refrigeration is playing a large part in assuring adequate food supplies for both the home and battle fronts.

For years, Curtis Condensing Units have supplied the food industry with dependable refrigeration, preventing food spoilage and waste. In the fields of processing, transporting, packing, storage, and distribution of the nation's food, Curtis equipment assures effective preservation under correct temperature and humidity control.

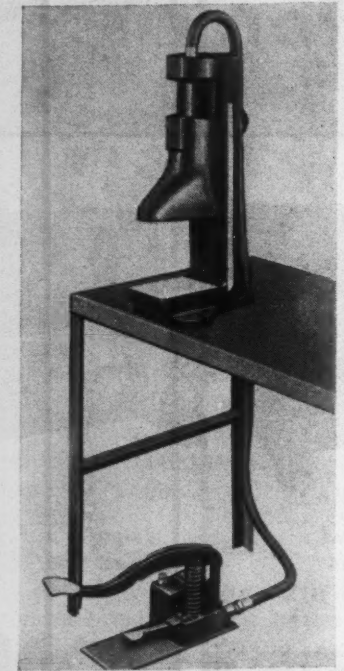
Today, Curtis' war job is building more and more Curtis products for our Armed Forces and Essential Industries. This wartime experience, added to that accumulated by Curtis in the past 90 years, assures even finer Curtis equipment for civilian uses after Victory is won.

FOR VICTORY
BUY
UNITED STATES
WAR
BONDS
AND
STAMPS

CURTIS REFRIGERATING MACHINERY DIVISION
of Curtis Manufacturing Company
1950 Kienlen Avenue, St. Louis 20, Missouri

CURTIS
REFRIGERATION
AIR CONDITIONING AND COMMERCIAL

Punch Press Can Be Used as Pipe Vise



No. 2722**—Combining the features of "V" way vise and a gap style press, a new precision bench press of semisteel construction can be used as a pipe vise, tensile or compression testing machine, or a shear.

Incorporating "V" ways to eliminate the use of die shoes, the press is designed for speedy and efficient handling of many production jobs. It is made in one size, 5 tons, and has a 5 x 6 in. platen with 7 in. of ram movement. Only two levers are used in the hydraulic foot control, one to apply pressure up to the rated tonnage and the other for release which has a two speed return. No outside air lines or power are needed.

The press is readily portable when mounted on a portable stand. The same machine is adaptable with proper equipment to be used as a tensile and compression testing unit up to 5 tons and as a pipe vise to handle up to 6 in. pipe, or as a shear for ¼ in. plate or ½ in. rounds.—Reimuller Bros. Co., 9400 Belmont Ave., Franklin Park, Ill.

Electrode Holder

No. 2723—A new insulated holder for welding electrodes, weighing but 22 oz, has a current rating of 300 amp with ample capacity for overload, and will handle various sizes of electrodes ranging from 1/16 to ¼ in. diameter inclusive.

The jaws are made of a high conducting and wear resisting copper alloy known as "Lincalloy", will withstand rough treatment, and are fully guarded from contacting the work by a spring steel insulating guard that is easily replaceable. The trigger of the holder is of molded, heat resisting, inorganic material.—Lincoln Electric Co., 12818 Coit Rd., Cleveland 1, Ohio.

Purifies Compressed Air

No. 2724**—A new "Pur-O-fier" designed to eliminate free moisture, oil, and all foreign matter with a heavier specific gravity than air from passing through the compressed air line is known as the "Model A-1" and uses centrifugal action as a medium for purification. It operates with from one to five cubic feet of air. A feature of the unit is that it weighs but 1¼ lb and is 3⅛ in. in diameter by 5-9/16 in. deep, including plastic and transparent entrainment sump. No maintenance is required on the unit other than draining the

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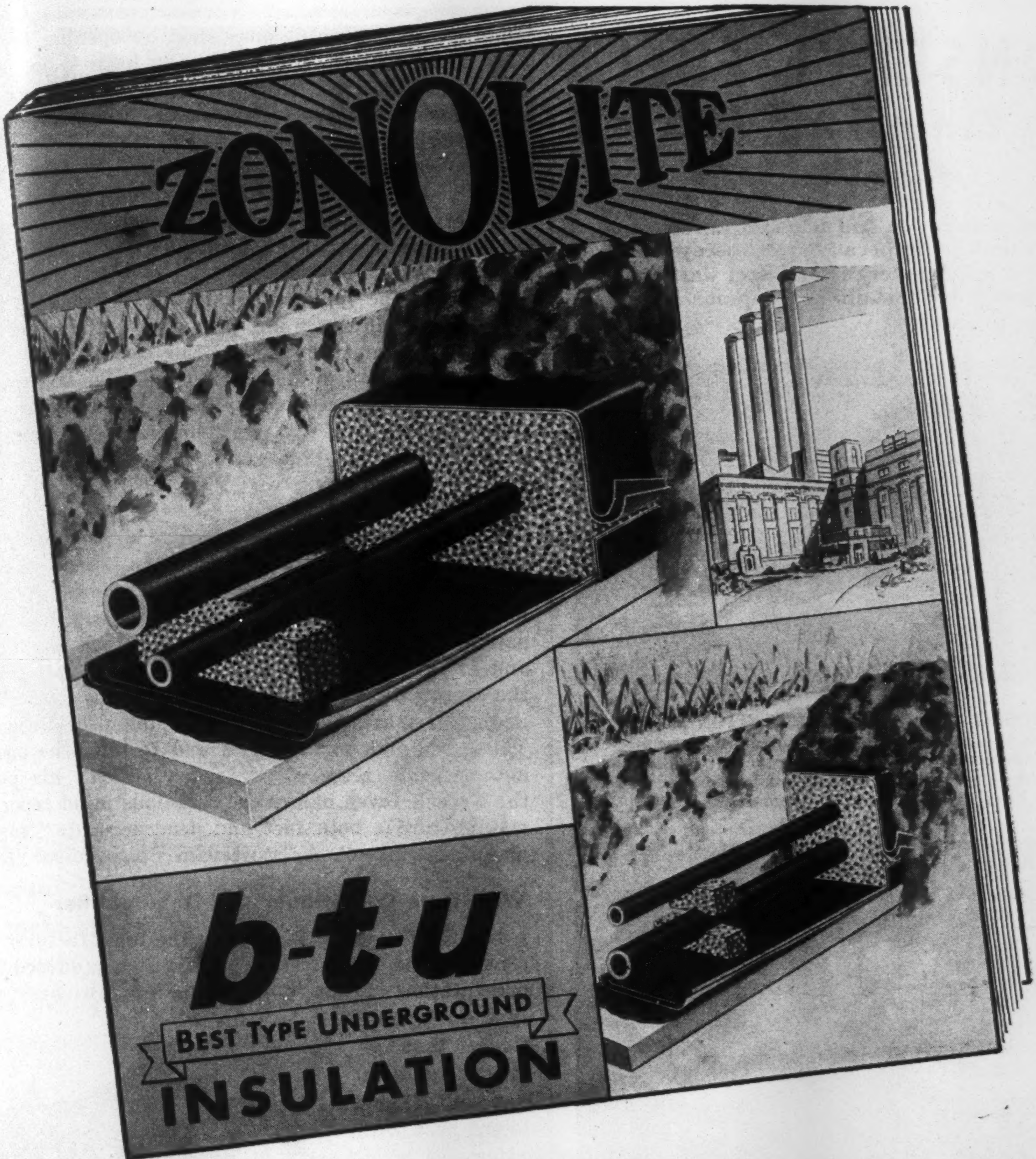

Send for THIS NEW DATA ON UNDERGROUND PIPING INSULATION

Every plant executive should have this NEW information on how to keep heat *IN* underground pipes, how to keep water *OUT,* how to simplify installation and how to minimize maintenance effort and cost. Folder describes Zonolite *b-t-u* Insulation which provides monolithic, unbroken covering of *permanent,* waterproofed insulation around the pipes. This affords *additional* protection by eliminating joints, hollow spaces or conduits that can fill with water, causing loss of insulation and corrosion.

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But... for a more complete story of this *new, fast, practical* way of insulating underground piping, send now for the new 4-page folder pictured above. Just mail the coupon *today.*

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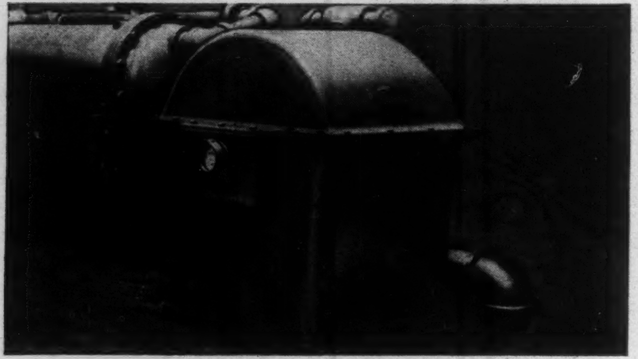
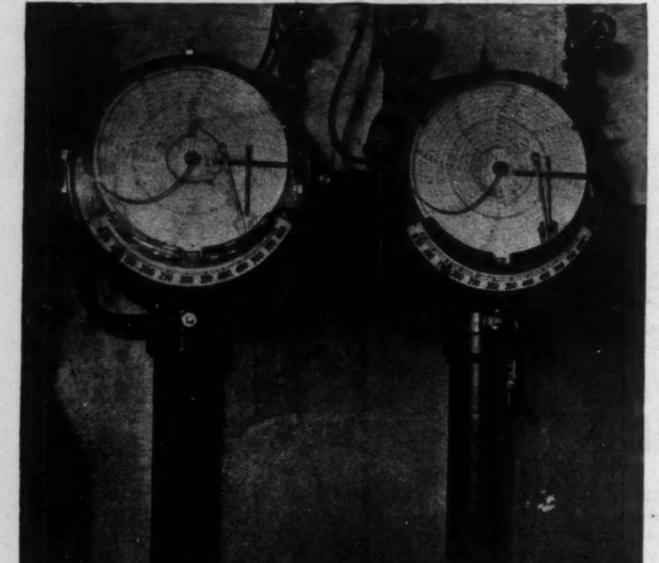
by Detecting Waste with Adsco Meters

Present manpower and transportation conditions make it imperative to conserve fuel. The first requirement is to detect waste and inefficiency by installing adequate metering equipment.



THE ADSCO ROTARY CONDENSATION METER provides the most economical means of determining steam consumption wherever it is possible to collect the condensate from steam heating or processing lines in a building or department.



THE ADSCO FLOW METER for Steam, Water, Air or Gas recommended where a 24 hour visual chart record of flow, an indication of the pressure and a totalization of the flow through the line is desired.

Both types of meter are rugged in construction and highly accurate in determining steam consumption so that the user can quickly spot the source of waste and conserve fuel by more efficient steam utilization.

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sump which can be accomplished by opening the petcock in the bottom. Standard units have ⅛ in. female pipe connections for intake and discharge pipes. It is ball bearing equipped for smooth operation and all parts subject to corrosion are plated.

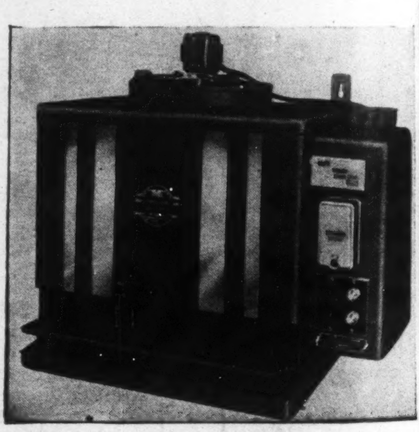
It can be used for air operated heating controls, air operated gages of the precision and checking type, and air operated cleaning devices on machine tools to protect them from corrosion, gumming due to moisture or oil and dirt contamination.

More specific applications are dental machines where absolute cleanliness is a requisite; production lines where parts must be kept clean for assembly; compressed air units for offset spray devices in breweries where vats are actuated by compressed air used for air-controlled automatic machines.—Bird-White Co., 3120 W. Lake St., Chicago, Ill.

Torque Wrench

No. 2725**—A "sensory" torque wrench which embodies the features of "sound" and "feel" has been announced. These features work as follows: A trigger finger is provided which can be set at any desired signalling point. As torque is applied with the wrench, and at the exact instant the "set" torque is reached, the sensory action (1) sounds a loud and distinct click and (2) imparts a definite strong impulse to the hand. Thus, "through sight, sound and feeling, the operator automatically releases (by reflex action) his pull on the wrench (even before the conscious mind reports it) making torque both fast and dead accurate," says the manufacturer.—P. A. Sturtevant Co., Addison, Ill.

Wall Type Conditioner and Dehumidifier



No. 2726*—What is said by the manufacturer to be a new development in air conditioning is offered in the presentation of the "Comfortaire" conditioner—a wall type air conditioner that removes up to 90 per cent of the latent heat with adjustable sensible heat control. Its feature is that it "produces true air conditioning without a cold, damp effect." It is said to eliminate the necessity for reheating equipment.

It is designed to meet the demand for a dehumidifier for essential industries such as textiles, parachute storage, printing plants, photographic studios, drafting rooms, instrument assembly rooms, the nylon and silk industry, paint spray drying rooms, and candy storage and display.

Operation is automatic, controlled by a humidistat and temperature control, and a solenoid valve. The condensing unit is set to defrost automatically on each off cycle. Since the air entering and leaving the unit bypasses the cooling coil, dehumidification is accom-

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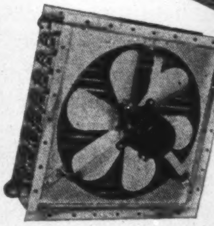
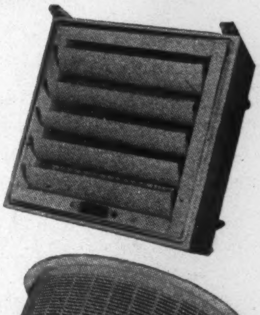


Inevitably the refrigeration industry will seek creative ideas and new structures in heat transfer in order to satisfy those demands.



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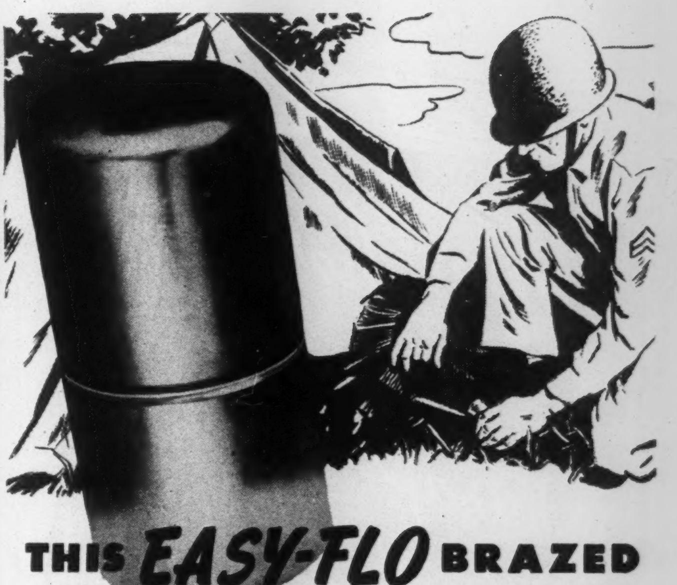

THIS *EASY-FLO* BRAZED INSECTICIDE DISPENSER *solved a liquefied gas container problem*

A great boon to our armed forces is the "aerosol" method of combating malarial mosquitos and other insect pests. It is based on the use of a liquefied gas, such as freon, as a solvent and propellant.

A development problem was a container for the liquefied gas that would stand field use. The answer was the container illustrated—made from cold-rolled steel stampings brazed with EASY-FLO.

That EASY-FLO was used, is not surprising. For it was well known, through wide-scale experience with EASY-FLO in the manufacture and installation of domestic, industrial and commercial refrigerating equipment, that this low-temperature silver brazing alloy reliably makes high-strength, liquid and gas-tight joints—and does it fast and economically.

Now this thoroughly proved EASY-FLO brazed container points the way to the solution of many peace-time container problems. It adds more convincing proof that when you need liquid or gas-tight joints that have to take it—braze with EASY-FLO!

A ring of EASY-FLO wire is preplaced in a groove in one stamping before assembling the two parts and heating.

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BULLETIN 12-A gives the reasons for the outstanding speed, reliability and economy of low-temperature EASY-FLO brazing. It is "must" reading for all design and production engineers. Write for your copy today.

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plished without appreciable loss of temperature. If desired, cooler temperatures may be obtained by a slight manual adjustment. Two sizes are ready for delivery.—American Coils Co., 25-27 Lexington St., Newark 5, N. J.

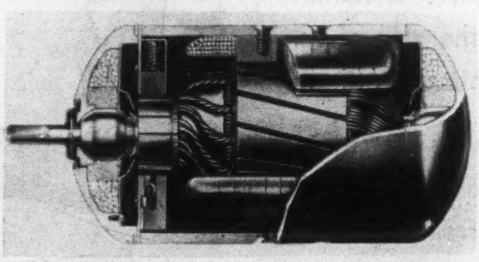
Water Analysis Apparatus

No. 2727**—The "Aero-Titrater" furnishes the plant operator and laboratory technician with a rapid, precise method for the determination of hardness, calcium and magnesium in waters, both industrial and potable; it is also widely applicable to water problems in the process industries, says the manufacturer.

The instrument is supplied calibrated and ready for assembly and use. There are no moving parts to wear out and no delicate features to go out of adjustment. All vital parts are of durable plastic construction.—Chief Chemical Corp., 55 W. 42nd St., New York 18, N. Y.

New Small Motors

No. 2728**—A new direct current "Micromotor" (illustrated), designed especially for the heavier tasks in automotive heating, ventilating, and air conditioning, and available in sizes from 1/20th up to 1/10th hp, has been announced. This unit will displace up to 600 cfm with blowers and up to 2400 cfm with fans.



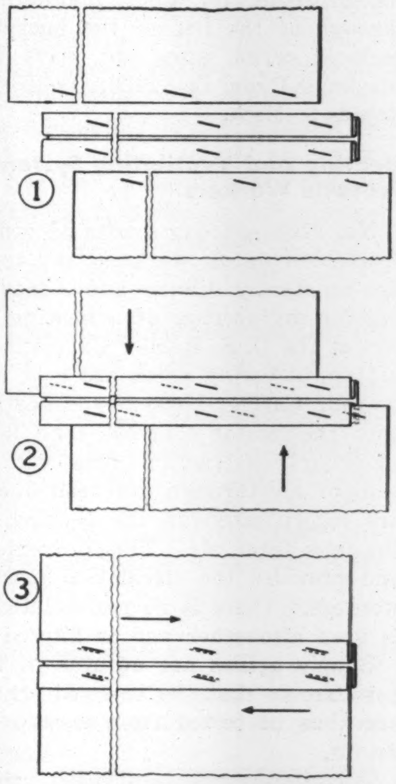
Patented modulated magnetic field design cuts out mechanical and magnetic noises and eliminates vibration. Cushion mounted armatures maintain quiet operation, says the maker.

A new shaded pole totally enclosed motor (not shown) for power requirements of 1/125 up to 1/25 hp, incorporating a new pressure locked, resilient, rubber mounting, has also been announced. Base mounted models utilize a new rubber mounting providing quiet operation. The mounting assembly consists simply of two rubber pads, two spring steel lock rings, and a base welded into a single rigid unit.

This "Micromotor" uses patented "Flush-Weld" rotor design. All rotor slots are copper filled flush with circumference with preformed copper inductors, fuse welded permanently into position for maximum electrical conductivity in the circuit. Modifications for different performance characteristics can be met by change of inductor resistance.—A. G. Redmond Co., Owosso, Mich.

Strip for Connecting Sheet Metal

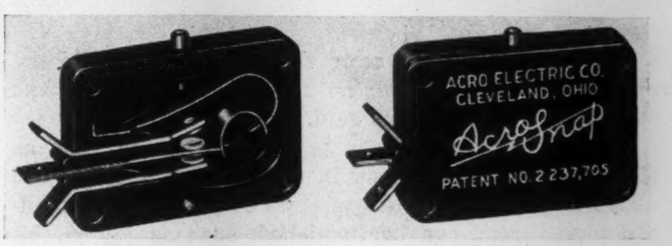
No. 2729—A new lock strip for connecting sheet metal can be taken apart as easily as it is assembled without injury to the strip or the sheet, and can be used wherever sheets of metal are joined (furnace casings, ducts, water heater jackets, lockers, metal shelving, casings, cabinets, etc.).



This strip is a double channel with indented louvers or notches, spaced uniformly at a 12 deg angle along the sides of the strip. Protruded louvers are made along the edge of the sheets, spaced and angled the same as the strip, as shown in the first sketch. The sheets are then pushed into the channel as shown in the second sketch and slid parallel to the strip until the louvers engage, forming a wedged lock as shown in the third sketch. To disconnect, this procedure is reversed.—Sheetlock Co., 4521 N. Clark St., Chicago 40, Ill.

Small Snap Action Switch

No. 2730**—One of the smallest, fully enclosed, snap action switches ever built, the new "Miniac" is only 17/64 in. thick, 13/16 in. high, and 1-3/16 in. long.



Engineered on the "rolling spring" principle, but with new design and smaller size, it is fully enclosed in a bakelite case with four mounting holes. Actuation is with a stainless steel pin plunger. All parts are noncorrosive and all contacts are of fine silver. This switch is rated at 15 amp, 115 volts a-c. Furnished in single pole, normally open and normally closed, double throw. Designed to permit leaf type or overtravel plunger type actuators to be attached to the case—Acro Electric Co., 1392 Superior Ave., Cleveland 14, Ohio.

Adjustable Spray Joint

No. 2731—The new adjustable joint illustrated, because of the ball and socket design, provides a full 50

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FITTINGS CAN BE REMOVED FROM
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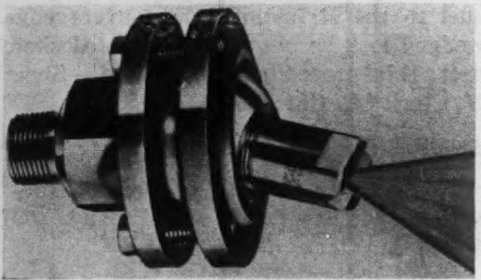

deg nozzle adjustment range in any plane at right angles to the face of the joint, the manufacturer states. The thick socket plates permit a strong friction grip, more than sufficient to hold the nozzle in fixed position, no matter how extreme the spraying operation, it is said.

This adjustable joint is made in brass or steel as standard, but may be had in a variety of special steel alloys as required. Various sizes of joints with standard pipe thread can be furnished, such as ⅛, ¼, ⅜, ½, ¾, and 1 in. Typical applications are found in equipment for washing, rinsing, and paint flow-coating.—Spraying Systems Co., 4031 W. Lake St., Chicago 24, Ill.

Low Capacity Pump

No. 2732—Laboratory and field tests have been completed on a new direct connected small capacity rotary pump, specifications for which are as follows: capacity, ½ gpm; discharge pressure, 100 psi; direct connected by a flexible coupling to an 1800 rpm motor; overall dimensions, length 11¾ in., width 5⅜ in., height 5 in.; weight 15¾ lb.

Builtin relief valves are optional and the units are available for belt drive, as a pump only, or the rotating elements may be supplied where the pump is installed as an integral part of a machine.

Due to the special "bucket design", these pumps are self-adjusting for wear, maintaining normal capacity throughout the life of the buckets, which are easily replaced when worn out, says the manufacturer.—Blackmer Pump Co., 1920A Century Ave., S. W., Grand Rapids 9, Mich.

Heating and Ventilating System Protects Workers

No. 2733—Strong drafts of ventilating air are kept from blowing on workers, and toxic vapors of benzol are constantly diluted and removed, as the result of careful engineering of a heating and ventilating system at the U. S. Rubber Co. plant at Naugatuck, Conn.

Manufacturing areas are held between 68 and 72 F by four Carrier blower type heating units. Equipped with thermostat controls, each heater has three nonsparking construction fans which circulate warmed outdoor air through overhead ducts. Mixing dampers are incorporated on the heating coils through which the fans force air. This prevents stratification of air and provides the circulation most satisfactory to the workers. There is no recirculation; air from outdoors is used altogether and is filtered through spun glass.

Supply grilles are as near to the 10 ft ceilings as possible, so that the warmed air diffuses. Employees are thus protected from excessive exposure to direct drafts.

Completing the ventilation cycle, air is constantly

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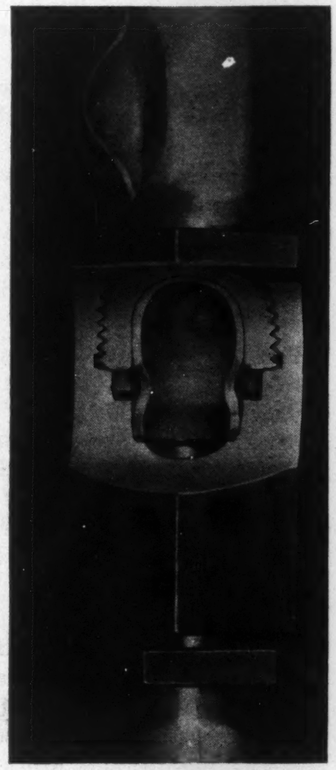
exhausted from the room by four additional fans. These take air off the floor through a system of subway gratings connected by ducts on the ceiling below.

The idea of such exhaust is conventional enough, but the Naugatuck plant's expression of it is uncommonly extensive. The system can change the air 12 times an hour. This level of performance was requested for protection of the health and safety of the personnel—mostly women who work with rubber solvent all day in assembling life rafts. Because of the frequent change of room air, the solvent's toxic vapors do not concentrate above specified safe limits. Furthermore, manufacture is sped, because the movement of air hurries the drying of rubber cement.

More protection and processing aid are provided by ventilated work tables on which solvent is applied to rubber sheets. Vapors from the operation are caught in an air stream at the table edge and exhausted through a plenum chamber underneath the table, then discharged outdoors. A lineal velocity of 600 to 700 fpm is maintained at the 2 in. exhaust slot. Permanent hoods over the table edge are used on some tables. On others the same function is performed by flexible tubing and portable fan units like those used by welders.

New Type of Hydraulic Connection

No. 2734—A new type hydraulic tube connection "which eliminates the tube flaring operation required with previous fittings, thus providing greater resistance to vibration breakage while simplifying installation procedures both in the shop and in the field," has been developed and is being made generally available through licensed manufacturers. While designed to meet specific needs of the aircraft industry, the new fitting, which provides a firm, leakproof joint and can be used with both low and high pressures, is equally adaptable to various other requirements, it is stated.



Basic parts consist of the fitting, a gland nut, a small metal collar, and a synthetic rubber sealing ring. The fitting is bored in four concentric diameters, corresponding respectively from the center out to the inside diameter of the tube, the outside diameter of the rubber ring and metal collar and the outside diameter of the gland nut, with the outside section threaded to take the gland nut.

To install the new fitting, one places the gland nut, metal collar, and rubber ring over the end of the tube in that order and inserts the tube in the gland as far as it will go. By turning up the gland nut, force is

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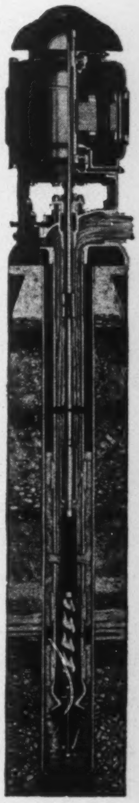
The only deep well pump of its kind
utterly different in design
The pump that "squeezes water uphill"



For many decades hydraulic engineers sought a reliable and efficient method of lifting water from small diameter deep wells. Guided by experience with thousands of successful turbine pump installations, Peerless engineers introduced, as a solution, a revolutionary type of pump—the *Hi-Lift*.

It is an amazingly simple, high-pressure deep well pump, embodying fewer working parts. "Magic wings" are given to water by the ingenious pumping element. Water literally soars in a continuous, non-turbulating flow.

Performance records prove the Hi-Lift to be the most economical of all pumps for small diameter deep wells, in capacities ranging from 10 to 55 gallons per minute. Ask for Bulletin.

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exerted on the rubber ring with the metal serving to keep the nut from tearing the ring. Since the sealing ring is completely confined, and rubber is not compressible, "the axial thrust so developed grips the tube and actually beads it. At the same time, the rubber is forced into every crevice to form a perfect seal and exerts an outward force on the gland nut, locking the threads. The beading operation is foolproof in that after the proper bead has been accomplished, the gland nut bottoms in the fittings and further crushing of the tube is impossible."

Laboratory tests have demonstrated the high pressure resistance and other characteristics of the fitting. On ⅝ diameter by 0.049 wall aluminum alloy tube installations pressures as high as 5000 psi have been successfully withstood, while on ⅜ by 0.035 tube the pressures have run up to 6200 psi, it is reported. In both instances it was the tube itself rather than the fitting or joint which failed.—Glenn L. Martin Co., Baltimore, Md.

Chemical Machinery

An exceptionally useful text is the book Chemical Machinery, by Emil Raymond Riegel, professor of industrial chemistry at the University of Buffalo. Its 27 chapters are crammed with information, data, and illustrations of a myriad assortment of equipment finding application in the varied processes of the chemical engineering industry. The author strives to embrace a certain routine in the case of each kind of apparatus presented—a classification by types of machines capable of performing a like function; a description of each, the length varying with the importance of the type, or the newness, or the likelihood of significant future development; where possible or desirable, the reasoning governing the conception of the device, its operation, and the determination of size for an intended service.

The book will be a valuable aid to plant designers, purchasing agents, process engineers, and all others concerned with the layout, erection, and operation of apparatus for the process industries. It is happily free of involved theory or complicated mathematics. There is some theoretical matter and an occasional simple formula, but in a style and amount that assists in understanding the problem of selecting a suitable piece of equipment for a particular purpose.

After discussing factors entering into plant location, the book presents three chapters on crushing, screening, and transporting solids, followed by two chapters on storing and conveying liquids. The seventh is devoted to weighing and proportioning liquids and solids, and the eighth and ninth to handling gases. Then there is a sequence of 10 chapters dealing with the strictly process operations of agitation, mixing, filtering, evaporating, crystallizing, drying, etc. Chapters 20 and 21 consider heat exchangers and application of heat and cold. The 22nd, possibly of most interest to readers of HPAC, is called gas conditioning; it implies controlling temperature, humidity, and movement of *any* gas. The next two chapters deal with hydraulic and other high pressure apparatus, and the concluding three treat of instruments.

Chemical Machinery is preeminently a practical book. The machinery discussed and illustrated meets three qualifications: it must have general application, it must be of standard design (i.e., catalog, not home-made), and it must be of plant-scale magnitude, not for laboratory use. In many cases, prices are indicated to enable the reader to make preliminary estimates of probable costs of a projected installation. There is much original data, and numerous examples are worked out to show how types may be compared, or a design selected, on the basis of probable production results.

The book has 583 + ix pages, 6 x 9 in.; the publisher is Reinhold Publishing Corp., 330 W. 42nd St., New York, N. Y. The price is $5.00.—*K.S.*

Thermodynamic Charts

Thermodynamic Charts—Steam, Water, Ammonia, Freon-12, and Mixtures of Air and Water Vapor is the title of a book by Frank O. Ellenwood, John Edson Sweet professor of engineering, Cornell University, and Charles O. Mackey, professor of heat-power engineering, Cornell University. It is the second edition of a work first published in 1939 and contains a series of charts showing thermodynamic properties. The data for steam are based on the Keenan and Keyes tables; anyone who has ever struggled with a single large Mollier diagram in tracing thermodynamic cycles will appreciate this convenient series of charts in book form.

The major part of the book is devoted to the properties of steam. A well thought out arrangement makes possible the tracing of any cycle from page to page as needed.

In addition to the properties of steam and water, charts of thermodynamic properties are also given for ammonia and for "Freon-12." These charts are also more convenient to use than the single large chart usually available. Finally, the book contains psychrometric charts for air conditioning. The psychrometric charts are based on sigma function instead of the more fundamental enthalpy.

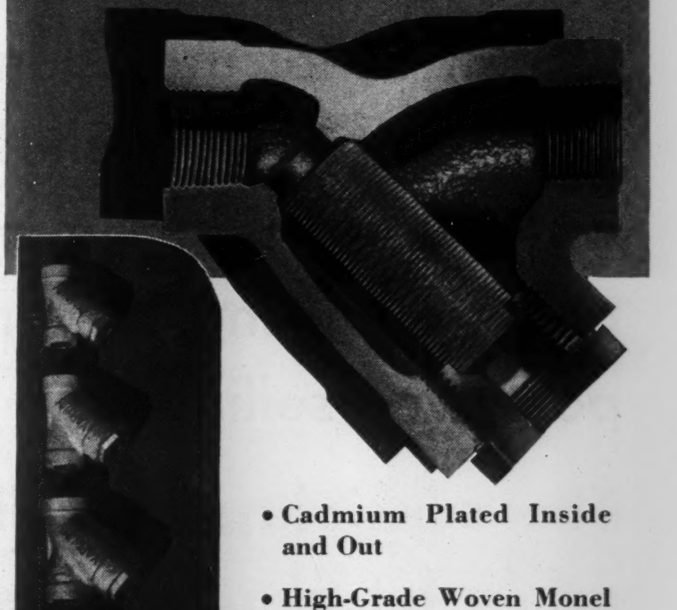
This book should prove useful for those who make frequent use of steam properties in analyzing various steam cycles.

There are 46+iv pages, 8¼x10¾ in. The publisher is John Wiley & Sons, 440 Fourth Ave., New York, N. Y., and the price is $2.75.—*W. G.*

The Mining Industries

The Mining Industries, 1899-1939: A Study of Output, Employment and Productivity, is a publication of the National Bureau of Economic Research, Inc., 1819 Broadway, New York 23, N. Y. The object of the bureau is "to ascertain and to present to the public important economic facts and their interpretation in a scientific and impartial manner." The authors of this particular book are Harold Barger, assistant professor of economics at Columbia University, and Sam H. Schurr, economist with the Office of Strategic Services. The book is an investigation into the output of the mining industries (including oil wells and stone quarries), the labor factors involved, and the changing

A *Better* STRAINER



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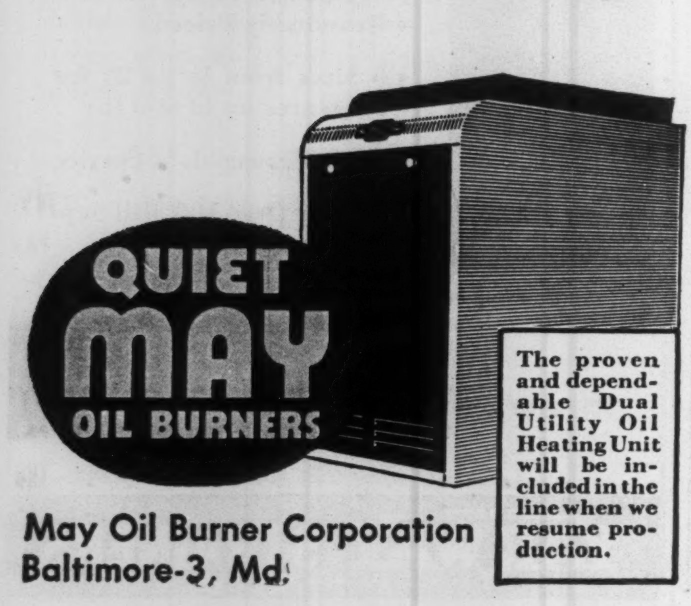

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relationship between output and employment. Broadly, the inquiry has two aspects: the compilation of data and its interpretation. Data on production were readily available; figures on employment, however, had to be pieced together from various sources—as, for instance, accident records. In interpreting the data, the authors try to account for such facts as large increase in tonnage output per man day in some mining operations as against small or no increase, or actual decrease, in others. Technologic development and progress characterize those mining industries that show an increasing output, other things being equal, while lack of such progress is manifest in others. But "other things being equal" in the case of mining may be a large factor, because in many minerals the more accessible seams are worked first, and those are often the richest, so that depletion of a certain resource may require mining of more remote deposits of poorer quality.

The material is arranged in an interesting and effective manner. The book contains 452+xxi pages, 6x8¾ in., including an index, five appendices of statistics, and a glossary of mineral and mining terms. The price is $3.00.

ASTM Approves Changes in Specifications and Standards

Many new specifications and tests for engineering materials and important changes in existing standards were approved recently by the American Society for Testing Materials acting through its committee on standards procedure. Recommendations on new standards coming from the ASTM's standing technical groups have been under development for some time, many for a year or more. Materials involved include—among others—steel forgings and castings, gray iron castings, malleable iron flanges, clay pipe, and embrittlement testing of boiler waters. In all 15 new standards were approved for publication as tentative, and there were revisions in some 30 previously issued specifications.

The society's work in standardizing specifications and test methods as now set up provides for a continuing outflow of material from its some 60 standing technical committees on which more than 2500 of the country's leading materials authorities are active. Several of the actions reported are intended to supplement material that is to be published in the 1944 Book of Standards, this book being issued one full year ahead of the normal date, because demands resulting from war efforts have depleted the present stock. Publication of the 1944 book involving 6000 pages in three parts is scheduled for December of this year.

The four new standards developed by committee A-1 on steel cover carbon steel and alloy steel blooms, billets, and slabs for forgings, and methods of magnetic particle testing and inspection of heavy forgings and commercial steel castings. The so-called billet specifications include considerable material not heretofore included; they also bring up to date the list of chemical compositions covered. An emergency provision goes with the alloy billet specifications giving a complete list of the N.E. steels.

Two of the steel committee groups have been conducting an intensive study on standardized technique, and recommendations for magnetic particle testing, and various technologists representing producers and consumers have reached decisions on a number of conflicting points. Eventually the steel committee hopes to issue a monograph on this method of testing with specification practices applicable to various steel products.

Intricasies of forgings, castings and methods of evaluating defects, have prevented the inclusion of any specific acceptance or rejection standards.

Among numerous revisions in steel standards are some affecting the austenitic or stainless alloys in the pipe and tubing field and projected changes in the commercial bar specifications, both hot rolled and cold rolled where eventually revised chemical compositions will be given and there will be added as information data on physical properties and suggestions on appropriate uses of the various grades.

A change in the wrought iron plate specifications A42 will permit modifications in yield point value the same as now provided for tensile strength on thick plates. The aim is to have a yield point not less than half the tensile strength.

Committee A-3 on cast iron is completing new specifications for material for pressure containing parts to be used up to 650 F, and also tentative specifications for light weight and thin sectioned gray iron castings were approved replacing the existing standard A 190, incorporating material that clarifies the intent on physical testing.

During the war period emergency specifications were issued covering the use of malleable iron castings for flanges, pipe fittings, and valve parts. Since they have proved serviceable, they are now being issued as regular ASTM specifications.

Two important recommendations on clay pipe involve a new tentative standard for extra strength material and revised specifications for standard strength clay sewer pipe. Extra strength vitrified clay pipe has been an item of extensive manufacture and use for more than 10 years. It is considerably heavier and is intended to sustain much higher working loads than the grades covered in previous standards. The revised specifications for standard strength pipe provide for increasing the width of joint spaces to improve both the product and the quality of the finished installation, and eliminate the need of cross references for computing minimum and maximum dimensions. The new specifications will unify the standards of the society with similar specifications of the government.

The new methods for embrittlement testing of boiler water, D 807, culminate an extensive investigation carried on by the joint research committee on boiler feedwater studies over a period of some 10 years. Operators of boiler plants have experienced cracking of boiler sheets and boiler tube ends, etc., for several decades and there has been very pronounced interest in this whole activity. In much of the work the U. S. Bureau of Mines took an active part through its research stations and technologists, and the new test uses the embrittlement detector which was developed by two of its investigators, W. C. Schroeder and A. A. Berk. Non-exclusive licenses for the manufacture and distribution are given at the discretion of the Secretary of the U. S. Department of the Interior.

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Horizontal Unit Heaters
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CAPACITIES

Model	Btu/hr.	Motor HP	Motor RPM	CFM	Final Temp. °F.
M-25C	25,400	1/45	1580	410	114
M-35C	35,000	1/33	1580	585	114
M-45C	45,000	1/33	1580	685	118
M-60C	60,000	1/20	1140	1020	114
M-87C	87,000	1/8	1140	1500	113
M-114C	114,000	1/8	1140	1905	114
M-140C	140,000	1/6	1140	2400	113
M-170C	170,000	1/6	1140	2650	118
M-215C	215,000	1/4	1140	3600	114
M-278C	278,000	1/2	1140	4300	118

Btu/hr. computed at 2 lb. gage steam pressure and 60°F. entering air.

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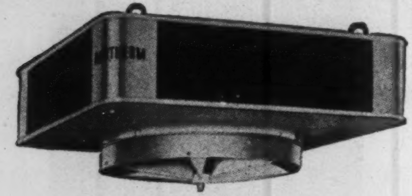

CAPACITIES

Model	Btu/hr.	Motor HP	Motor RPM	CFM	Final Temp. °F.
V-145C	145,000	⅛	1140	2700	114
V-175C	175,000	⅓	1725	3400	111
V-191C	191,000	¼	1140	3300	118
V-234C	234,000	½	1725	4300	114
V-260C	260,000	½	1140	4550	115
V-340C	340,000	½	1140	5600	120
V-480C	480,000	1	1140	8000	120
V-600C	600,000	1½	1140	11000	115

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Aftercoolers

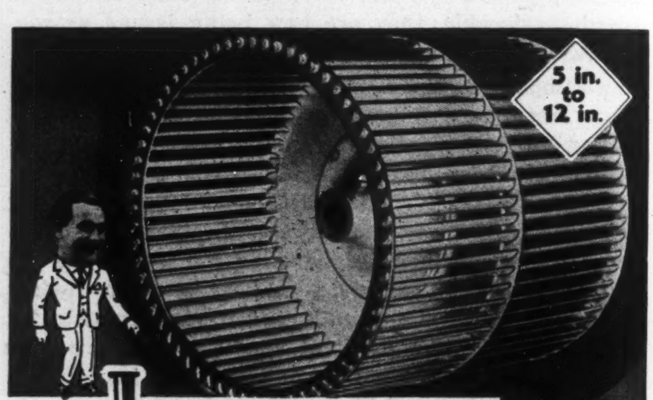
No. 4812—2 p. bulletin (98), including a colored operating drawing of the "Aero" aftercooler for compressed air service, explaining how water and oil are kept out of compressed air.—Niagara Blower Co., 6 E. 45th St., New York 17, N. Y.

Air and Heat Recovery

No. 4813—File folder telling the story of fuel and energy conservation in connection with heating, ventilating, and air conditioning by means of "Dorex" air recovery equipment which comprises canisters filled with activated carbon for adsorbing gaseous impurities from recirculated air. Typical cost comparisons are given and the equipment is briefly described and illustrated.—W. B. Connor Engineering Corp., 114 E. 32nd St., New York 16, N. Y.

Ammonia for Refrigeration

No. 4814—16 p. booklet on refrigeration with ammonia, giving data on ammonia and shipping con-



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tainers for it, outlining fundamentals of both compression and absorption refrigeration, and with data on oil traps, accumulators, and foul gas purgers and their proper operation.—Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia 7, Pa.

Condensate Return System

No. 4815—12 p. bulletin (3250) on "C-B" system for returning condensate to boilers at high pressure and high temperature, and for increasing heat transfer rates in steam processing equipment. Adaptable to process equipment operating at pressures up to 200 psi. —Cochrane Corp., 3131 N. 17th St., Philadelphia 32, Pa.

Diesel Engine Hose

No. 4816—4 p. folder (2000) on diesel engine hose with table of standard sizes and information on minimum effective lengths of steel exhaust hose. Standard end connections are illustrated.—Seamlex Co., Inc., 27-27 Jackson Ave., Long Island City 1, N. Y.

Draft Controls

No. 4817—2 p. circular on fuel conservation with commercial draft controls, illustrating and describing briefly their features and listing three advantages of their use.—Field Control Div., H. D. Conkey & Co., Mendota, Ill.

Drives

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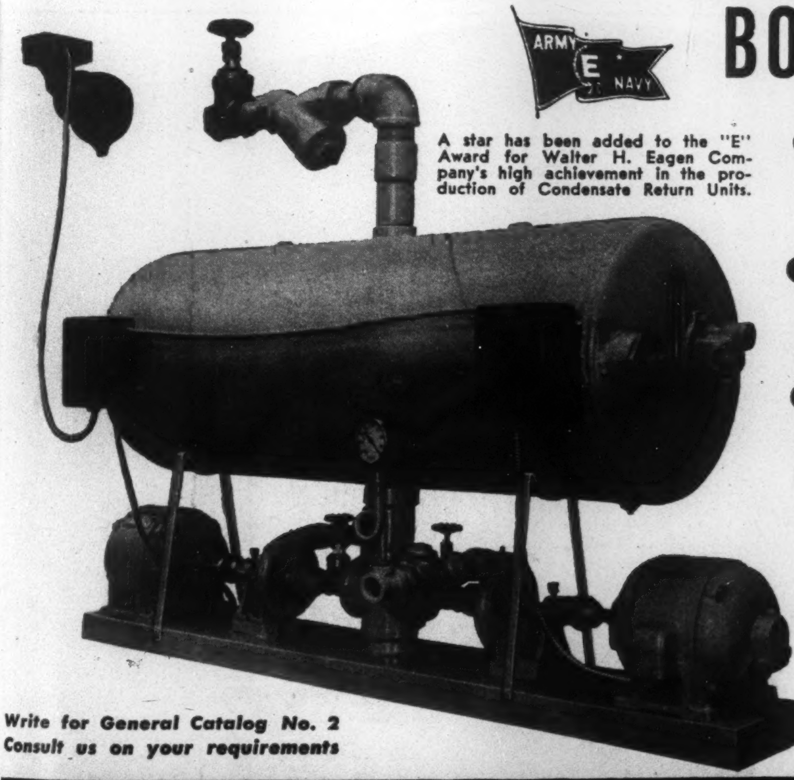

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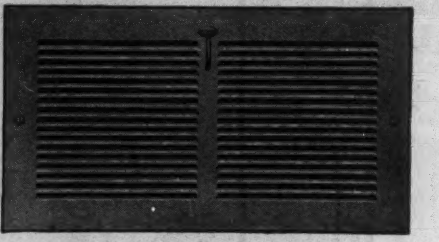

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list of references.—Solvents Div., Electrochemicals Dept., E. I. du Pont de Nemours & Co., Wilmington 98, Del.

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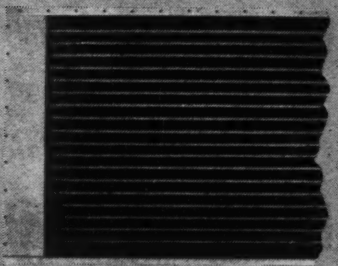

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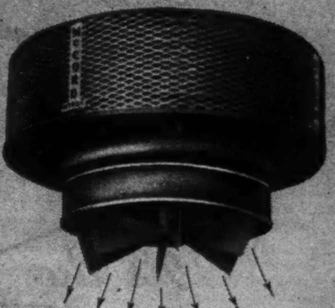

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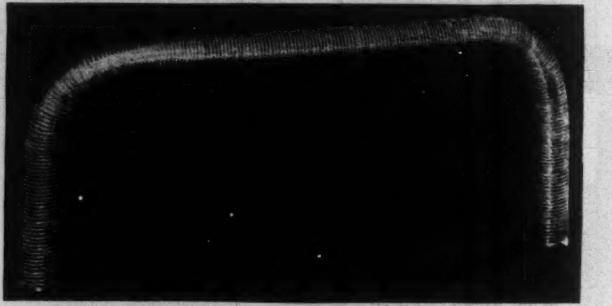

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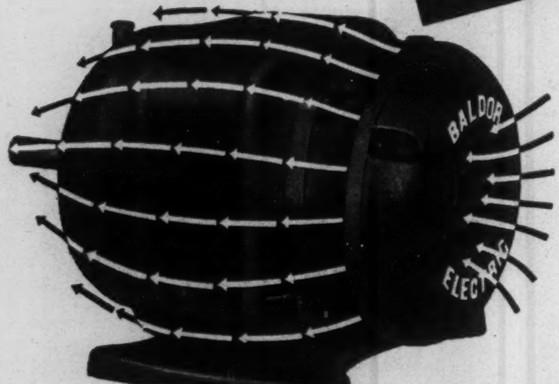

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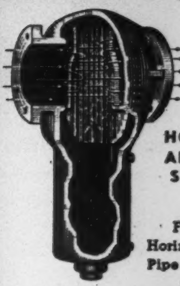

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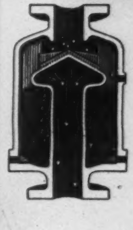

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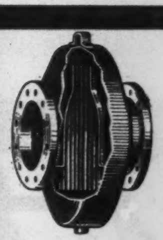

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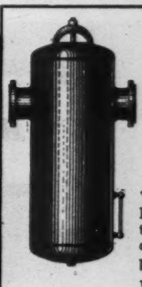

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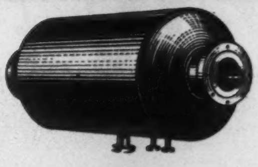

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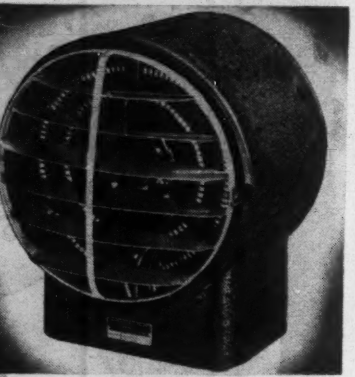
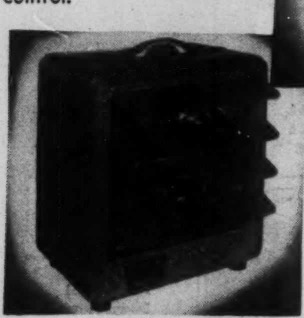


For Large Rooms
Type CUB Chromalox heater, in four sizes—15 to 40 kw. Powerful blower drives air through Chromalox air blast heater. Circulating warm air streams can be directed as required. Blower can be operated without heater, for summer cooling. Thermostatic or manual control.



For Smaller Rooms
Type UB Chromalox heater—eight sizes—2 to 15 kw. Ceiling or wall mount. Smaller sizes portable. Heating unit is the efficient Chromalox Koilfin. Protected against overheating by thermostatic switch. Other sizes and types available. Write

EDWIN L. WIEGAND COMPANY
7610 Thomas Blvd. · Pittsburgh 8, Pa.

Help the War Effort by Conserving Fuel!

for engineers with tables of bursting pressures of tubing from ⅛ to 9⅜ in. OD.—Globe Steel Tubes Co., 3839 W. Burnham St., Milwaukee 4, Wis.

Vibration Control

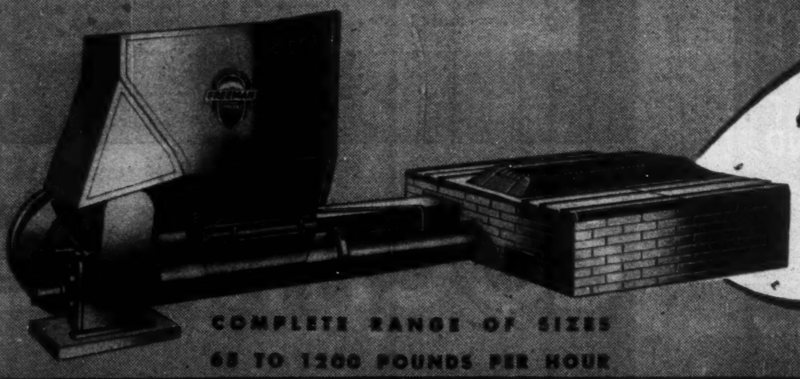
No. 4834—6 p. bulletin on vibration control as an aid to production, maintenance reduction, product quality, and building protection, with specific information on fan bases and vibration dampeners and a reference chart on these bases and heavy duty bases.—Vibration Control Co., 545 Fifth Ave., New York 17, N. Y.

Welding Design

No. 4835—Eight sheets on practical design for arc welding, giving sketches of foundation lugs, guides on columns, gear case corners, reinforced access openings, medium size gear blanks, pedestals for machinery bases, and surface with bolt slots, illustrating designs for fabrication by arc welding.—Hobart Brothers Co., Troy 1, Ohio.

FREEMAN STOKERS

FIRST CHOICE OF AMERICA'S FOREMOST HEATING ENGINEERS



A PIONEER OF THE STOKER INDUSTRY... ONE OF THE LEADERS IN NATIONAL SALES VOLUME...

COMPLETE RANGE OF SIZES
65 TO 1200 POUNDS PER HOUR

FREEMAN STOKER DIVISION, ILLINOIS IRON & BOLT CO., 918 SO. MICHIGAN AVE., CHICAGO 5, ILL.

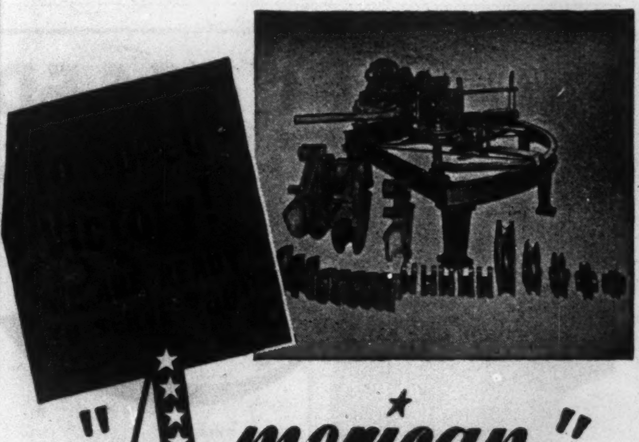
• WPB . . . OPA . . . PAW . . . Etc. •

Recent Revisions of Government Orders

Boilers—A majority of steel boiler manufacturers will no longer be required to report their proposed shipping schedules to the WPB, it was announced September 30. Only those producers who are still primarily engaged in filling military orders will be requested to schedule their deliveries, WPB officials explained. A decrease in military demands for steel boilers made it possible to remove scheduling restrictions from most producers and thereby eliminate excessive paper work.

Coal—Consumption of bituminous coal during August increased at a rate faster than it was stocked, with the result that on September 1 the average number of days' supply in consumers' hands was 42, as compared with 44 days on August 1, the office of Secretary of the Interior Harold L. Ickes announced October 9.

Construction—J. A. Krug, WPB chairman, announced last month that in order to provide a centralized point of control over all matters pertaining to construction within WPB, a construction bureau was being established, responsible to Hiland G. Batch-



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COLD PIPE, CONDUIT and TUBE BENDING MACHINES

Twelve types to select from. Hand operated capacities ¼ to 6" inclusive. Motor operated ¾ to 8" inclusive.

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PIPE BENDING MACHINE
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BOSTON, MASS.

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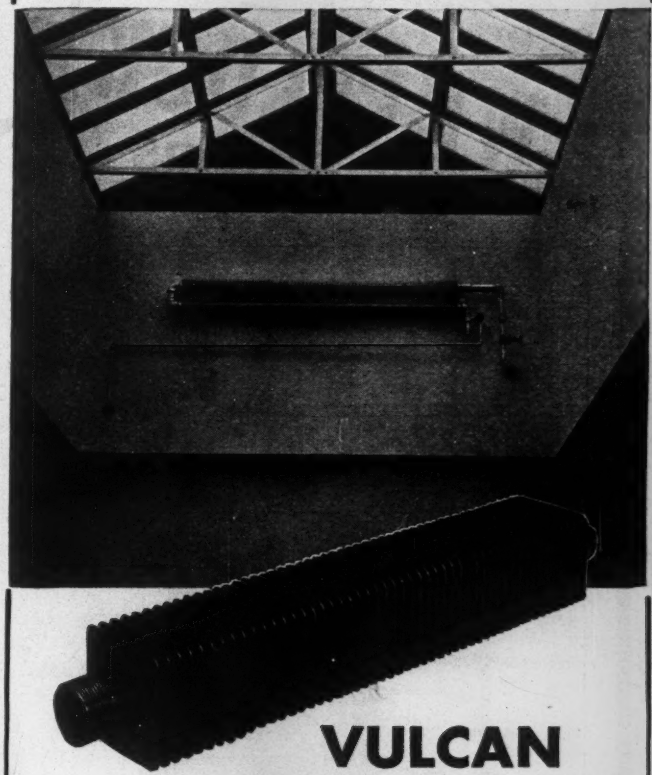

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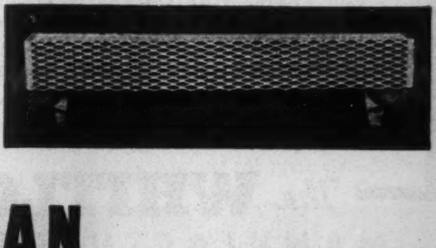
FIN-TYPE RADIATORS

Imagine the difficult and cumbersome job that would be encountered installing heavy pipe or cast iron radiators in place of the VULCAN fin-type installation shown above. In this case VULCAN radiation was installed easily and effectively in that heat distribution was provided where it was needed and cold down drafts were eliminated.

This is only one of many applications where VULCAN serves to maintain even temperature control. In hospitals, churches, theatres, auditoriums, schools, ships and industrial plants all over the country VULCAN is proving through its wide range of use and application to be the accepted modern radiator.

Send for latest Catalog showing performance charts.



Where desired, grille covers can be furnished for VULCAN radiation.

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RADIATOR CO.

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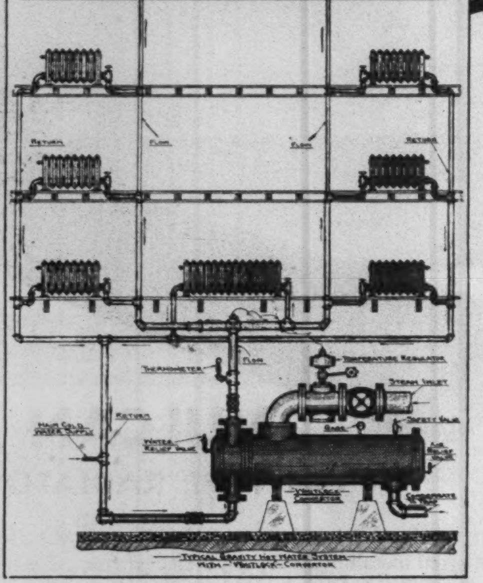
HARTFORD 6, CONN.

RADIATOR MFGS. FOR ALMOST TWO DECADES

the most efficient heating plants use —

WHITLOCK CONVERTORS



IN SPACE HEATING SYSTEMS USING HOT WATER

WHITLOCK Convertors are giving reliable, efficient heating service in hundreds of prominent industrial plants, hospitals and other buildings. Used in gravity or forced circulation systems, WHITLOCK Convertors save fuel and deliver full heat rating, year after year. There is still time to install your WHITLOCK Convertor before cold weather—order without delay!

Our engineering service is available to help you in the selection and installation of WHITLOCK Convertors. Contact our nearest representative or write us today.

Have you a copy of our new booklet "Care and Handling of Heat Exchangers"? Copy on request.

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MANUFACTURING CO.
44 SOUTH ST., ELMWOOD, HARTFORD 1, CONN.

Branch Offices: New York, Boston, Chicago, Philadelphia, Detroit, Richmond

Authorized representatives in other principal cities—consult local telephone directory under our name.

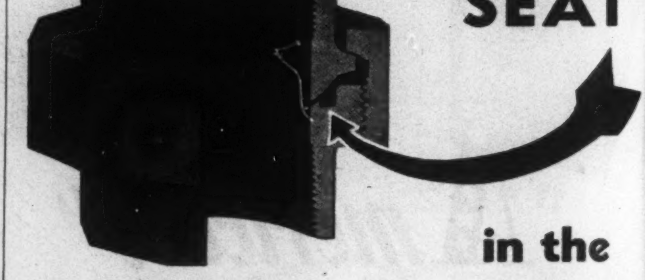
Whitlock Equipment (Whitlock-Darling) is manufactured in Canada by Darling Brothers, Ltd., Montreal

eller, operations vice-chairman. The bureau includes the existing building materials division, the construction machinery division, the plumbing and heating division and the bulk of the facilities bureau, which is being abolished.

Copper—Removal of restrictions on the use of copper and copper base alloy in the manufacture of 17 civilian and commercial items was announced by the WPB October 20. The items include supply and return water lines for radiators for passenger carriers having a seating capacity of not less than 11 persons, and solder bushings for plumbing installations. The restrictions were lifted by an amendment to conservation order M-9-c. Permission to manufacture copper and copper base alloy sheet, roll, strip and rod for building construction for repair and replacement purposes and to fill U. S. military contracts will now be granted, WPB officials said.

Electrical Conduit—Restrictions on the installation of electrical conduit, electrical metallic tubing, and raceways have been removed from order L-225, which was amended October 6 by the WPB. Formerly, installations were permitted only for specified end uses. Restrictions were imposed as a temporary measure to save critical materials. Their removal is now possible because the supply of the type of steel used in the manufacture of conduit, tubing, and raceways has eased, WPB said. The amount of metal (by weight) that may be used in the manufacture of this equipment is still limited by L-255 on the basis of the

The RECESSED BRASS SEAT



in the
JEFFERSON UNION

is cut from seamless drawn tubing —free from all casting defects— sound and uniform always!

JEFFERSON UNION CO.
601 West 26th Street, New York 1, N. Y.
Factories at
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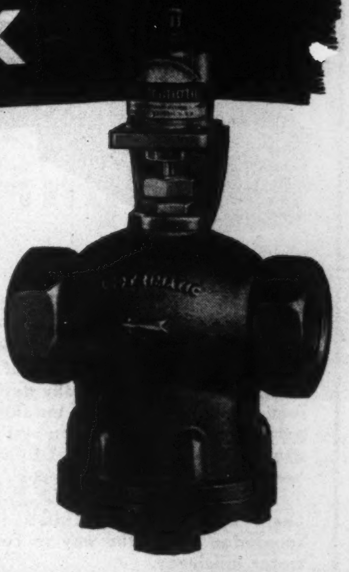
amount used in 1941. The order also retains provisions restricting sales by manufacturers and distributors to those with preference ratings of AA-5 or better.

Furnaces—The WPB amended October 23 its furnace order, L-22, to remove a number of restrictions that have outlived their usefulness. The provision that required that each manufacturer produce furnaces only in the fuel types he manufactured during the three-year period ending April 11, 1942, has been removed. The amended order also eliminates the restriction limiting casings for furnaces of less than 250,000 Btu to 26 ga and lighter steel. The provision that restricted the production of water pans, humidifiers and detachable nameplates was removed because the iron and steel order, M-126, prohibits production of humidifying equipment, and the nameplates are usually made of aluminum, which is noncritical now.

Heating Equipment—The WPB announced October 12 items of heating and plumbing equipment included in the list of civilian items for which a supplemental allotment of 58,428 tons of steel was made available for the fourth quarter. Items included are all domestic cooking and heating stoves, warm air furnaces, oil and gas floor and wall furnaces, warm air distribution equipment, underfired gas water heaters, hot water storage tanks, range boilers, low pressure steam and hot water heating specialties, and combustion, heat generation, and distribution controls. Manufacturers of any of this equipment who desire to obtain material under this allotment must file supplemental

DELUXE TYPE
WK



De Luxe type WK Pressure Actuated Water Regulating Valves for Freon, Sulphur or Methyl, are pilot operated modulating. Standard adjustable opening range from 50 to 150 lbs. Factory set to open at 90 pounds. Precision engineering and individual testing for low cost satisfactory performance. Available in sizes of 3/4 to 2 inches FPT. Simple adjustment—easily serviced.

Other sizes and types are also available.

Electrimatic
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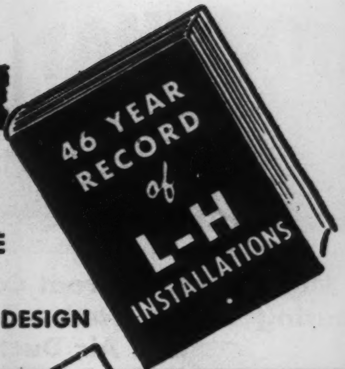
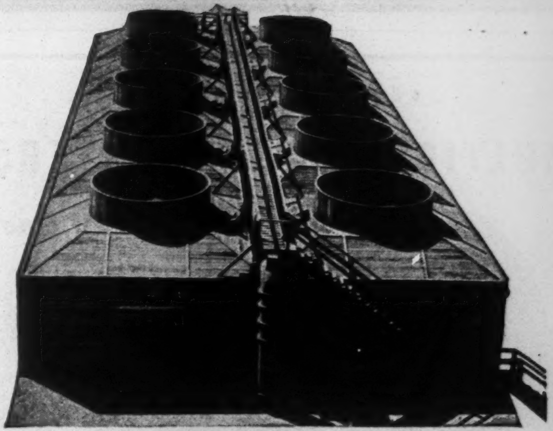
the SOURCE *of* PRE-TESTED PERFORMANCE *in* COOLING TOWER DESIGN


46 YEAR RECORD of L-H INSTALLATIONS

the REASON

"The proper coefficients for reducing (cooling tower) theory to practice are known by few ... knowledge can be obtained only through long years of practice ... observation of results produced by various installations ... with varying atmospheric conditions ... under different bases of efficiency."

Typical APPLICATION



Installed for War Department at large government arsenal for condenser water cooling.

Type: 10-cell Induced Draft Tower, back-to-back construction.

Construction Features: Independent operation of individual, or cell groups. Motors located out of air stream. Redwood discharge stacks prevent recirculation.

Capacity: 13000 GPM ... 20 degree range.

NOTE: No leaks in tower casing ... watertight wall construction. Photographed after 14 months operation.

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COOLING TOWERS, INC.
Manufacturers of All Types of Water Cooling Towers
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STOP THAT DRIP

No More Damage from Condensation or Sweating Pipes, Tanks, Walls, Ceilings and Air Ducts

NoDrip

A SURE CURE

• This sensational plastic cork coating prevents condensation drip from metal, concrete, brick, wood, plaster or composition surfaces. Permanently protects metal against rust and corrosion, thus prolonging life of pipes, tanks, etc. Forms a moisture-proof, insulation type coating impervious to acid and alkali.

Stucco-like finish requires no maintenance. A gallon covers about 30 feet of ½" pipe. Dries in 24 hours. Comes in 1, 5 and 55 gallon drums.

Immediate Shipment. Order from your Supply House.

FREE *NoDrip Circular about Condensation Drip and its Prevention.*

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Forward and Backward Curved Blades

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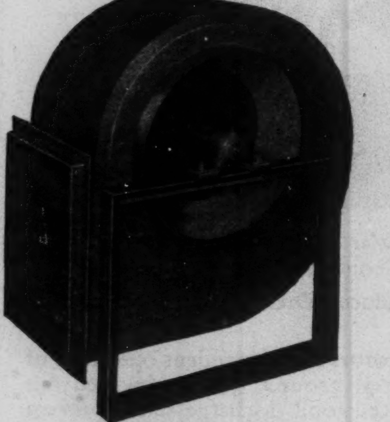

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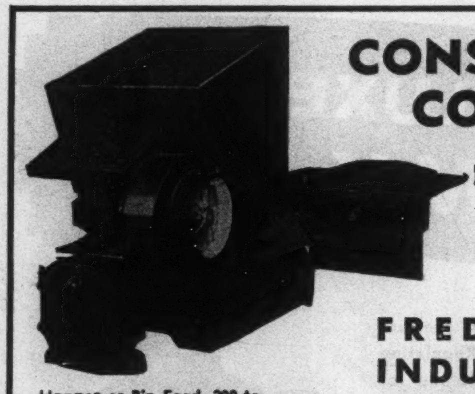
controlled materials plan 4B applications with the WPB plumbing and heating division. With each request for additional material a manufacturer must submit form WPB-3820 giving all necessary information as to his labor supply for the requested increase.

Lithium Compounds—In view of reduced military demands for lithium compounds, the WPB revoked order M-191 October 6, governing allocation of the chemical. Uses for lithium compounds include dehumidification and air conditioning.

Magnesium—All government controls on the use of magnesium for civilian products have been removed, the WPB said October 5 in announcing the revocation of preference order M-2-b. Simultaneously, order M-2-c was issued, which provides that all restrictions on the use of magnesium contained in other WPB orders no longer apply. However, restrictions in other orders as to the quantity of an article that may be made or as to its size or type remain applicable even if the article is made wholly or partly of magnesium.

Oil—Industrial consumers of fuel oil will be able to apply for additional inventory reserves sufficient to fill storage tanks, regardless of former limitations on the amount of reserve allowable, the OPA announced October 10. The liberalized ruling is one of several changes being made in the fuel oil regulations. Another change provides that consumers who acquire, in connection with the premises where they are living, oil heating stoves that were installed under WPB priorities, are eligible for fuel oil rations on the same basis

CONSERVE COAL BY USING THE TIME TESTED FREDERICK INDUSTRIAL STOKERS



Hopper or Bin Feed. 200 to 850 lb. per Hour. Clinker Type; or Side Dumping Grate.

You are perfectly safe in installing a FREDERICK INDUSTRIAL STOKER with the expectation of a reduction in coal bills. The FREDERICK was specifically designed to meet the heavy-duty requirements of industrial installations. Its matchless design was perfected to assure low combustion per square foot of its extra size grate area. Underfeed firing gives maximum extraction of heat from every pound of coal.

Learn all about FREDERICK INDUSTRIAL STOKERS. The knowledge points the way to coal conservation and complete stoker efficiency.

FREDERICK STOKER BULLETIN Sent Promptly On Request

THE Frederick IRON & STEEL CO.
Frederick, Maryland

as consumers who get such stoves separately by ration certificate. To clarify a former provision that was effective September 1, and which extended the validity of class 3 coupon sheets indefinitely, OPA said that all these class 3 coupon sheets will continue to be valid even though an expiration date appears on the sheet. (Amendment 28 to revised ration order 11, effective October 13.) Fuel oil consumers whose equipment was designed to use and regularly uses residual oil (Nos. 5, 6 or bunker C having an API gravity of 20 deg or below) may apply to local ration boards for an additional ration for heat or hot water, or both. (Amendment 29 to rev. RO 11, dated November 4.)

Oil—Petroleum Administrator Ickes announced October 24 that in view of the improved fuel oil stock position he had called upon the OPA as the rationing agency to permit fuel oil consumers who have converted to coal to return to the use of fuel oil.

Oil—Effective October 21, petroleum distribution order No. 13 was amended to permit the use of any grade of fuel oil for coal spray purposes.

Refrigerants—Use of substitute refrigerants, such as methyl chloride, sulfur dioxide and ammonia, to take the place of "Freon-12" must be continued until the "Freon" situation improves, according to an amendment to conservation order M-28 passed by the WPB September 27. It had been expected that the restrictions on the use of "Freon-12" in air conditioning would be discontinued on September 30, but an unexpected shortage of anhydrous hydrofluoric acid,

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THIS GAGE TELLS
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HAYS

HAYS AIR-FILTER GAGE

- *Automatic*
- EASY TO INSTALL
- SAVES MONEY
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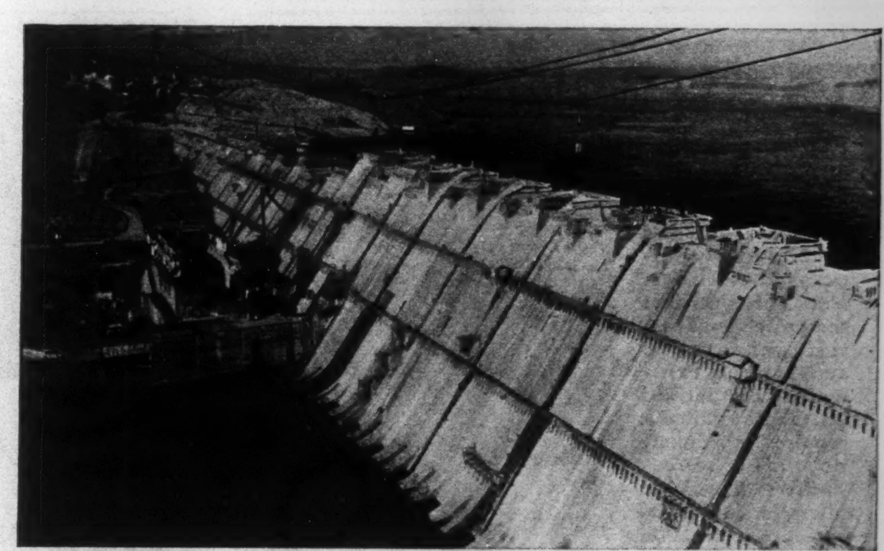
If you are confronted with the problem of not knowing when the collected dirt in your filters is of sufficient density to decrease operating efficiency, install a HAYS Air-Filter Gage. The HAYS indicator shows amount of air resistance at all times—tells when to renew filter element—eliminates guess work—can be made to sound alarm when resistance is excessive. Write for full information. Ask for HAYS Bulletin A-F G.

The HAYS CORPORATION
COMBUSTION INSTRUMENTS AND CONTROL
MICHIGAN CITY, INDIANA, U.S.A.

Another Great Dam Benefits from FRICK Engineering and FRICK Refrigeration



Stretching across the north fork of the White River, in Arkansas, Norfork Dam is 2624 ft. long and 220 ft. high—the fifth largest concrete structure of its kind in the U. S.

Frick Refrigeration played a triple role in hastening the building of this great Dam. To prevent dangerous heating as the concrete hardened, the water going into the mixers was chilled almost to the freezing point: in very hot weather tons of crushed ice were also supplied; after being poured, the monolith was cooled for months by circulating chilled water through 900,000 ft. of pipe imbedded in the mass.

Frick Engineering and Frick Equipment served with distinction on this big project. Which leads us to repeat: "For the really important jobs, specify Frick Refrigeration."

Write Frick Co. for complete description of this unusual job.

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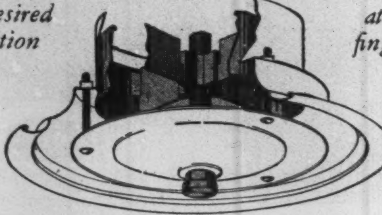
PROVIDES MAXIMUM EFFICIENCY
THROUGH CONTROLLED AIR DIFFUSION

Any desired condition *at your finger tip*



KNO-DRAFT *Type K Adjustable Air Diffuser with Type D Volume Damper.*
Patented

All Kno-Draft Air Diffusers are also equipped with *air direction* adjustment to suit seasonal or individual requirements. Their engineered design insures more effective room air mixing, more uniform room temperature and controlled, noiseless, draftless air diffusion at low cost.

Write for descriptive folder D.

W. B. CONNOR ENGINEERING CORP.

114 East 32nd St. WB CONNOR ENGINEERING CORP. New York 16, N.Y.

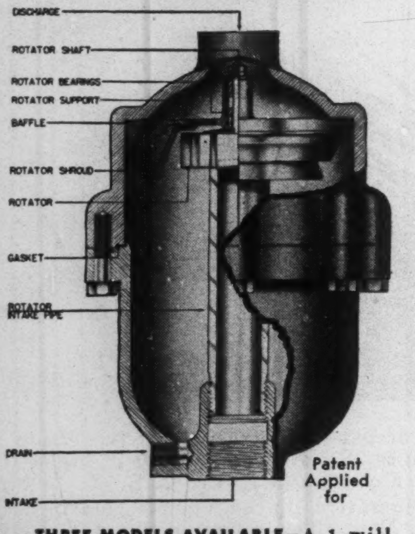
a component of "Freon-12," made this impossible, WPB officials said. New "Freon" facilities had been completed that were capable of producing, together with existing facilities, a total of approximately 5½ million lb of "Freon" per month. This amount of production would have been sufficient to meet all known military and civilian requirements during the fourth quarter of 1944. The shortage of anhydrous hydrofluoric acid that developed, however, made it necessary to operate the "Freon" facilities at less than 70 per cent capacity. The situation is expected to be improved shortly as a result of additional allotments of hydrofluoric acid. Plants may expect sufficient amounts of hydrofluoric acid to produce 12 million lb of "Freon-12" during the fourth quarter, a WPB chemicals bureau official said. By February enough of the acid is expected to keep "Freon-12" plants operating at capacity as the construction of two new hydrofluoric plants is expected to be completed at that time.

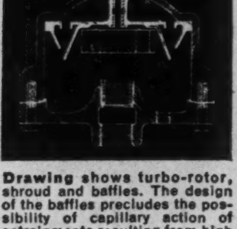
Refrigeration and Air Conditioning Items—The possibility of programing limited production of such items as ice cream dispensary cabinets, freezers and low temperature cabinets, soda fountains and self-contained air conditioning units before "Victory-in-Europe" Day is being explored, WPB officials told the general refrigeration and air conditioning industry advisory committee at a meeting last month. The production of such items is now prohibited by order L-38. Fractional horsepower motors are expected to be available after "V-E" Day to the refrigeration and

NEW TURBO-ROTOR *Pur-O-fier*

For Compressed Air

This new unit effectively eliminates moisture, oil and scale from compressed air lines. Pur-O-fier utilizes the principle of centrifugal force to separate entrainments from purified air. Once installed it requires absolutely no maintenance. Penstar Tru-Bond oiless bearing guarantees long, trouble-free operation. Manual or automatic drains provided.





Drawing shows turbo-rotor, shroud and baffles. The design of the baffles precludes the possibility of capillary action of entrainments resulting from high velocity.

THREE MODELS AVAILABLE—A-1 will accommodate volumes from ½ to 5 cu. ft. A-2, volumes from 10 to 35 cu. ft. A-4, volumes from 35 to 100 cu. ft. Multiple units are recommended for volumes above this range. Pur-O-fier is the only standard unit that can be engineered to meet any air volume for regular or intermittent service.

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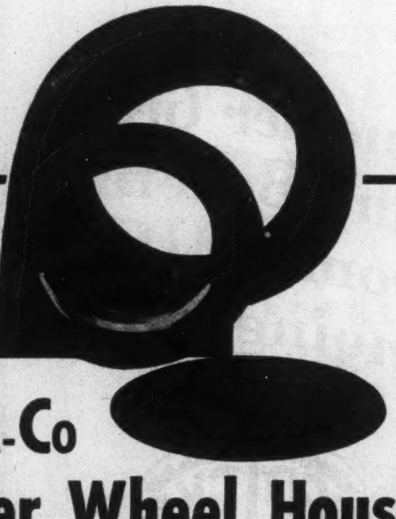

DE-STA-CO
Blower Wheel Housings
of Standard Dimensions

Made in sizes to fit 4½, 5, 6, 7½ and 9 inch wheels and in widths to suit single or double inlet wheels . . . also individual parts for your own assembly.

De-Sta-Co housings are engineered for maximum efficiency and quietness in operation . . . neatly finished. Send for "De-Sta-Co Blower Housings" bulletin; gives complete information, including essential dimensions.

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Established Over 25 Years
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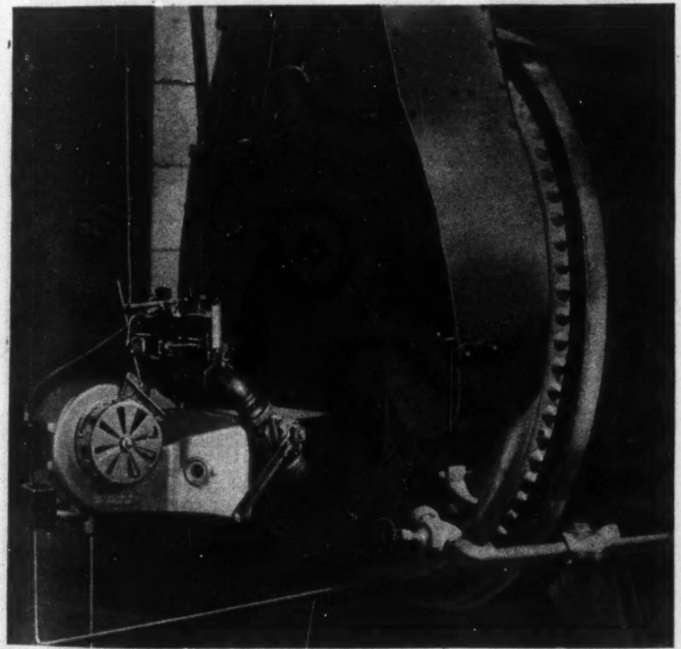
air conditioning industry to meet its 1939 level, WPB officials reported. WPB has revoked schedule IV and schedule V of order L-126. Schedule IV standardized valves, fittings, accessories, and other components used in the manufacture of refrigerators and air conditioning units. Schedule V prohibited the use of ferrous and nonferrous metals in the exterior and interior of walkin coolers.

Service Equipment—Any piece of building service equipment authorized or rated by the WPB on a special application form, or any piece of processing or service machinery or equipment, whether or not specifically approved, may now be installed in an existing building without permission under conservation order L-41, regardless of cost limits, the WPB reported recently. This action was taken by amendments to conservation order L-41 and to direction 2 of the same order. Direction 2, as amended, provides that it is not necessary to get WPB permission under L-41 to install or relocate in an existing building any piece of processing or service machinery or equipment regardless of the total cost of the job. Processing machinery or equipment is machinery or equipment used for the manufacture, processing or fabricating of materials or products. Service machinery or equipment is defined as equipment used in a building by means of which a particular service is rendered in the building; for example, x-ray equipment in a hospital, projector or screen equipment in a theater, cold storage enclosures of coolers in a store or commercial establishment. The direction also permits the installa-

The Mettler "FAN-AIR" Gas Burner
As Applied to Scotch Marine Boilers
NOTE THE SIMPLICITY OF THIS APPLICATION



A Modern Complete Gas Burner System

"Fan-Air" is a mechanical draft fully automatic gas burner system—ideal for difficult jobs and can be used under natural draft operation also. Nothing else like it. Sizes 5 to 300 B.H.P. Qualified dealers wanted.

Ample Stock of Fan-Air or Natural Draft Burners for Prompt Shipment

LEE B. METTLER CO.
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Famous
FIRE-GUARD
Automatic Coal Stokers
have **EVERYTHING** *you want*

DEPENDABLE . . . DURABLE . . . EFFICIENT

The FIRE-GUARD Automatic Coal Stoker is built for long, satisfactory service. Thousands of users, everywhere, have proven its worth.

CAPACITY from 70 to 400 pounds per hour . . . we have a size for YOUR needs.

Above sizes (CLASS A) Now Available.

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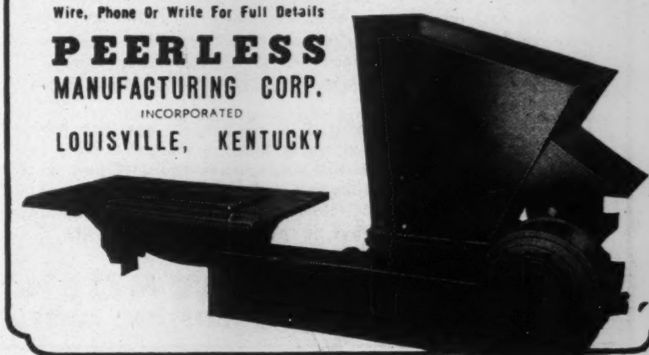

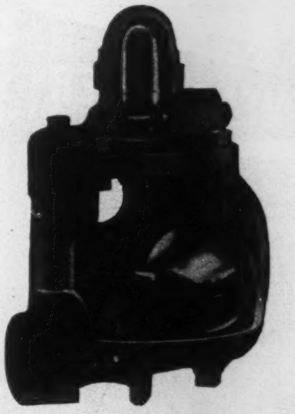

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FLOAT and THERMOSTATIC TRAPS

These Traps are designed to take care of any low pressure job up to 15 lbs. They will not become air bound as they employ the Bourdon Tube on the by-pass. Our underslung valve principle makes it safe at all times. No danger building up a pressure with this type of valve.

Furnished in sizes ¾", 1" and 1¼".

HAINES has proven its

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NEW
Low Cost Regulator

Will Not Rattle . . .

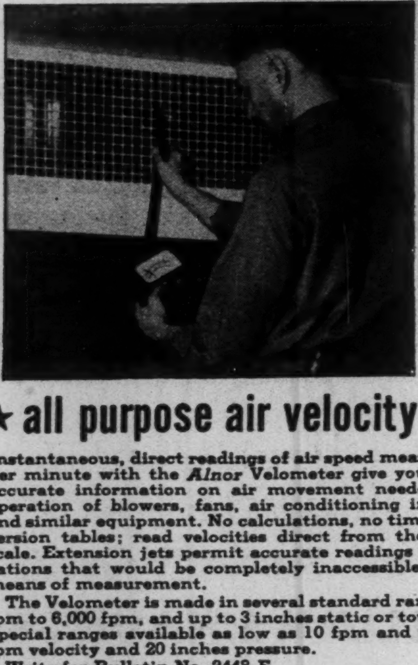
STAYS in Position

The Dial Damper Regulator No. 13 utilizes a new regulating mechanism instead of the finger tip control plunger. This popular and dependable type regulator is built for those jobs requiring a sturdy constructed regulator that embodies positive control features at a reasonable price. It is being used and recommended by some of the largest war-time shipbuilders.

The Dial Damper Regulator No. 13 will fit any size pipe, round or square. It is extremely light in weight, simply installed in a few minutes without special tools. Open and shut positions made by moving handle from left to right. Position held positive by tightening wing nut on handle. Will not rattle . . . stays in position always! Write for details.

MARTENS & STORMOEN
15 HATHAWAY ST. BOSTON, MASS.

Alnor VELOMETER



★ all purpose air velocity meter

Instantaneous, direct readings of air speed measured in feet per minute with the *Alnor* Velometer give you the quick, accurate information on air movement needed to check operation of blowers, fans, air conditioning installations, and similar equipment. No calculations, no timing, no conversion tables; read velocities direct from the Velometer scale. Extension jets permit accurate readings in many locations that would be completely inaccessible with other means of measurement.

The Velometer is made in several standard ranges from 20 fpm to 6,000 fpm, and up to 3 inches static or total pressure. Special ranges available as low as 10 fpm and up to 25,000 fpm velocity and 20 inches pressure.

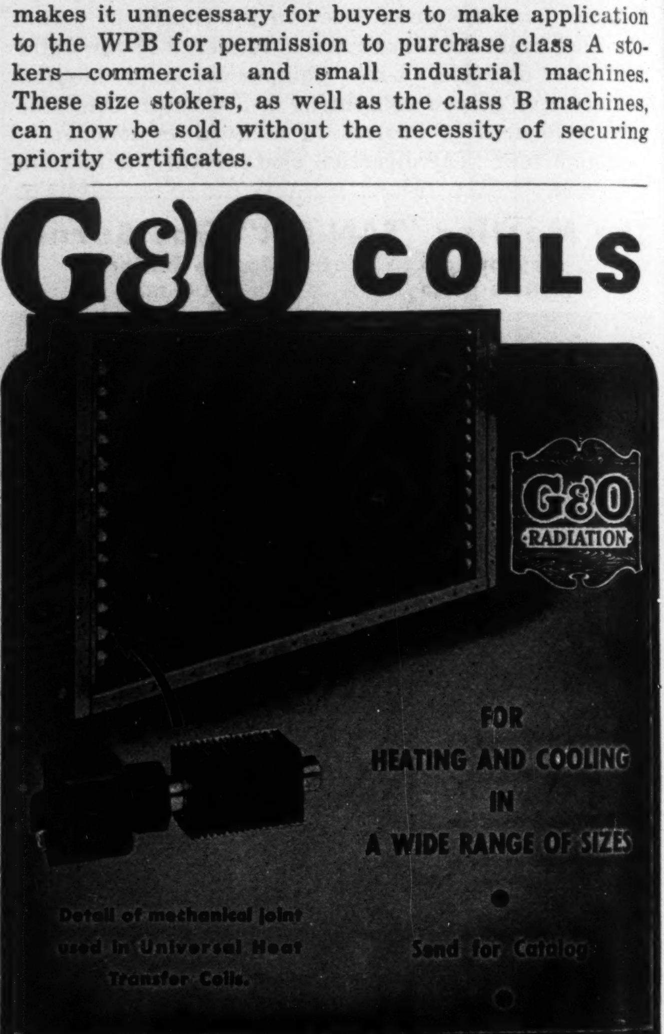
Write for Bulletin No. 2448-E.

Illinois Testing Laboratories, Inc.
419 NORTH LA SALLE STREET • CHICAGO 10, ILLINOIS

tion of building service equipment, such as heating, air conditioning equipment, lighting, elevators or escalators, regardless of the total cost of the job, if the equipment has been authorized or rated on a WPB special application form. In addition, building alterations required in connection with the installation may be made, but no new buildings or additions to existing buildings may be constructed, WPB stressed. Materials required for the installation or necessary alterations may be obtained under direction 15 to controlled materials plan regulation No. 5, which was recently amended to give, to persons not specified on schedule A of that regulation, preference ratings and allotment symbols for the limited acquisition of such materials.

Stokers—Installation of coal stokers is controlled by WPB under its construction order, L-41. That order permits installation of stokers without WPB approval, however, if the installation results in a saving of coal and if coal was formerly used as a fuel. New installations of coal stokers which necessitate a change in fuel still require WPB approval, however. In such cases, applicants desiring permission to make commercial or industrial installations should file an application with WPB on form WPB-617. The October 3 revision of the stoker order, L-75, makes it unnecessary for buyers to make application to the WPB for permission to purchase class A stokers—commercial and small industrial machines. These size stokers, as well as the class B machines, can now be sold without the necessity of securing priority certificates.

G&O COILS



THE G&O MANUFACTURING COMPANY
New Haven, Connecticut
Pioneer Manufacturers of Square Finned Tubing in the United States

MEETINGS & CONVENTIONS

Industrial Hygienists

Industrial Hygiene Foundation, ninth annual meeting, November 15-16, Mellon Institute, Pittsburgh. The program will consider sickness in industry and problems connected with sick absenteeism which call for postwar solutions, and there will be a panel on putting disabled veterans back to work. The headquarters office of the foundation is at 4400 Fifth Ave., Pittsburgh 13, Pa.

Chemical Exposition and Conference

National Chemical Exposition, November 15-19, Chicago Coliseum, 15th and Wabash, sponsored by the Chicago section of the American Chemical Society. Marcus W. Hinson, 330 S. Wells St., Chicago 6, Ill., is the exposition manager. A feature of the show will be the National Industrial Chemical Conference.

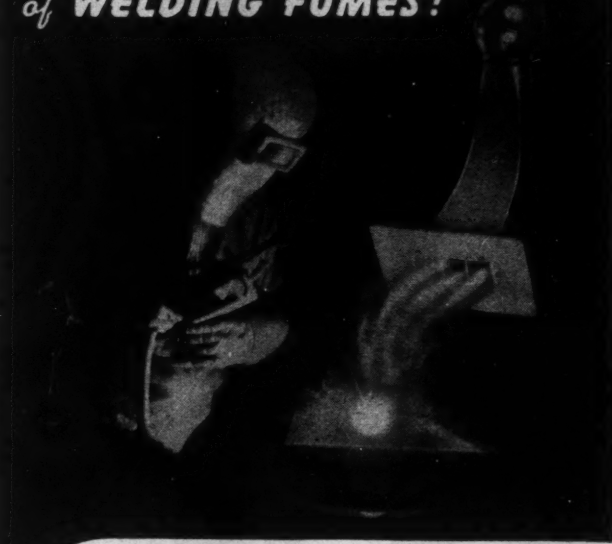
Refrigeration Jobbers

National Refrigeration Supply Jobbers Association, annual meeting, November 20-22, Edgewater Beach Hotel, Chicago, Ill.

Power and Mechanical Engineering Show

National Exposition of Power and Mechanical Engineering, November 27-December 2, Madison Square

GET RID
of WELDING FUMES!



The powerful suction created by Ruemelin Fume Collectors draws out noxious gases, smoke and heat at the source. *Cleans shop air with minimum loss of building heat.* Covers maximum territory. Guards employee health. More than 1,000 serving war plants all over the nation. Shipped completely assembled, easy to install.

Write for Bulletin 37-C

RUEMELIN MFG. CO., 3896 N. Palmer St., Milwaukee 12, Wis.

RUEMELIN FUME COLLECTOR

A 4275-¼A

The No-Stain
Pipe Joint Cement

Using Rutland Pipe Joint Cement saves a lot of cleaning up afterwards. It does not stain hands or fixtures. Also, Rutland seals joints tightly and lasts indefinitely —but always leaves pipes easy to disjoin. Remains soft in can.

Mail post card for free sample. Rutland Fire Clay Company, Department H-24, Rutland, Vt. Also makers of Rutland Retort Cement, Furnace Cement, Asphalt Paint, Concrete Patcher.

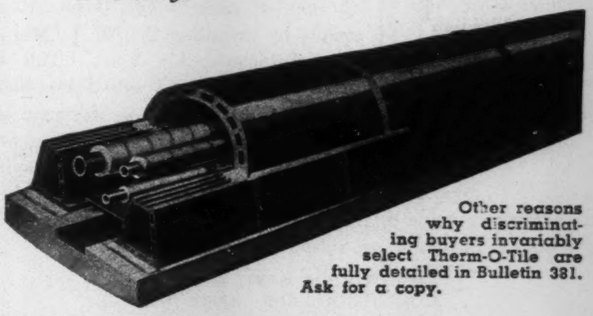
RUTLAND
PASTE PIPE JOINT CEMENT
RUTLAND FIRE CLAY CO.
RUTLAND, VT.

??? DRY INSULATION ???

That's a very important question.

Unless the insulation in underground steam conduits is really DRY, it is about as good as no insulation at all.

Therm-O-Tile assures DRY insulation — PERMANENTLY — *not* merely for a year or so. Bulletin 381 tells *why.*



Other reasons why discriminating buyers invariably select Therm-O-Tile are fully detailed in Bulletin 381. Ask for a copy.

Sold and installed by Johns-Manville Construction Units in all Principal Cities. See Sweet's Architectural Catalog or The Heating Guide.

H. W. PORTER & CO., Inc.

822H Frelinghuysen Ave., Newark 5, New Jersey

Garden, New York City. Apparatus for production, control, distribution, and transmission of heat and power to be featured. Charles F. Roth, president of the International Exposition Co., is manager of the show. Headquarters office is at 480 Lexington Ave., New York 17, N. Y.

Mechanical Engineers

American Society of Mechanical Engineers, annual meeting, November 27-December 1, Hotel Pennsylvania, New York City. In accordance with the request of the Office of Defense Transportation, this meeting is intended to be a "localized" project. Headquarters office of the ASME is at 29 W. 39th St., New York 18, N. Y.

Refrigerating Engineers

American Society of Refrigerating Engineers, 40th annual meeting, December 10-13, Hotel Pennsylvania, New York City. The program includes papers on the history of refrigeration, by Harry Sloan, Vilter Mfg. Co.; heat operated refrigerated cycles, by Dr. R. S. Taylor, Servel, Inc.; moist air research, by Dean John A. Goff, Towne Scientific School, University of Pennsylvania; differential temperature expansion valves, by F. Y. Carter, Detroit Lubricator Co.; control of evaporative pressures, by Walter A. Grant, Carrier Corp.; pipe insulation for steady and intermittent refrigeration service, by W. P. Berggren and R. L. Perry, University of California; home freezers, by Dr. D. K. Tressler,

POWERS

INDICATING and RECORDING THERMOMETERS

Some of the many different types of Dial Indicating and Recording Thermometers we make are shown here. We also make Recording Regulators and Regulators combined with easy to read Indicating Thermometers. **Write for Bulletins.** Specify type of instrument in which you are interested.

THE POWERS REGULATOR CO.
2759 Greenview Ave., CHICAGO

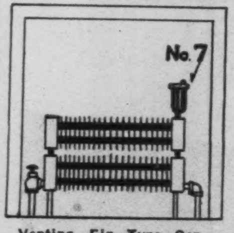
Offices in 47 Cities—See your phone directory

50 Years of Temperature and ★ Humidity Control ★

GET THAT AIR OUT OF THERE

And Keep It Out With

AUTO-VENT AIR ELIMINATORS


No. 7

Venting Fin Type Convector Radiator

Circulation Troubles?

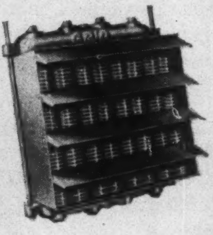
Don't fight air pockets or traps in hot or cold circulating lines? "Get that air out of there" *and keep it out* simply by installing the No. 7 Maid-O'-Mist Automatic Air Vent. This reliable air vent has a self-closing float-controlled valve and is designed especially for circulating pipe lines, convector radiators, unit heaters, cooling manifolds, tanks, diesel engines, or any other application where air pockets or traps retard the free circulation of liquids. Now available in bright brass finish.

APPROVED FOR NAVY, MARITIME
COMMISSION AND ARMY USE

MAID-O'-MIST INC.
211 NORTH ABERDEEN STREET
CHICAGO 7, ILLINOIS

AUTOMATIC HUMIDIFIERS
ALL TYPES
TING SYST

INSTALL UNIT HEATERS NOT FOR THIS WINTER— *but for years to come....* **INSTALL GRID**



here's why!

★ One piece construction heating sections (patented) of high test cast iron that withstand steam pressures up to 250 lbs.
★ No soldered, brazed, welded or expanded connections to become loose or develop leaks.
★ No electrolysis to cause corrosion, breakdowns, leaks, or heating failures.

"Even under very severe service after 10 years we have found GRID Unit Heaters to be maintenance free," reports one Midwest plant. In other plants GRID Unit Heaters have been in continuous operation for 10, 12, and more years without maintenance, because GRID Unit Heaters are built to last. The materials used in their fabrication will stand very severe service. So why install unit heaters with less permanency and efficiency? Complete data and capacity tables upon request.

HIGH TEST CAST IRON HEATING SECTIONS

GRID

D. J. Murray Manufacturing Co.
WAUSAU, WISCONSIN

Forward
WITH THE 6TH WAR LOAN!

Official U. S. Marine Corps Photo

Keep Your Plant's Quota "OUT FRONT!"

Victory depends upon materials—as well as men! To keep our American forces "closing in" overseas, you and every other manufacturer here at home must *keep on making* "Out Front" War Bond Quotas!

This means *action now* on every point in the fighting 8-Point Plan to step up Payroll Deductions. For instance, have you a 6th War Loan Bond Committee, representing labor, management and other important groups in your company? Selected Team Captains yet—preferably returned veterans? If so, have you instructed them in sales procedure—and given each the Treasury Booklet, *Getting the Order*?

How about War Bond quotas? Each department—and individual—should have one! Assigning responsibilities is vital, too! Have you appointed enough "self-starters" to arrange rallies, competitive progress boards and meeting schedules? Are personal pledge, order or authorization cards printed, and made out in the name of each worker? Planning for resolicitation near the end of the drive? Your State Payroll Chairman is ready now with a detailed Resolicitation Plan. And, have you contracted for space in *all* your regular advertising media to tell the War Bond story?

Your positive *Yes* to *all* points in this forward-to-victory 8-Point Plan assures your plant meeting an "Out Front" Quota in the 6th War Loan—and speeds the day of unconditional surrender!

6th
WAR
LOAN

The Treasury Department acknowledges with appreciation the publication of this message by

HEATING, PIPING & AIR CONDITIONING

This is an official U. S. Treasury advertisement—prepared under the auspices of Treasury Department and War Advertising Council.

DO YOU NEED COILS

FOR ANY OF THESE APPLICATIONS ?
CHECK HERE
DEHYDRATING
HUMIDIFYING
SPACE HEATING
TEMPERING
REFRIGERATING
SPACE COOLING

• Eliminate special design and tool costs by selecting your coils from the wide range of standard sizes and models made by Young. Or take advantage of Young engineering service to obtain coils to meet your specific requirements as to size and materials (within the limits of government regulations). • Young coils embody many exclusive construction features . . . . are made of quality materials . . . . are thoroughly tested and accurately rated. • In addition to coils, Young produces many other types of heat transfer equipment. If *your* problem is heat transfer, consult Young engineers.

YOUNG RADIATOR COMPANY
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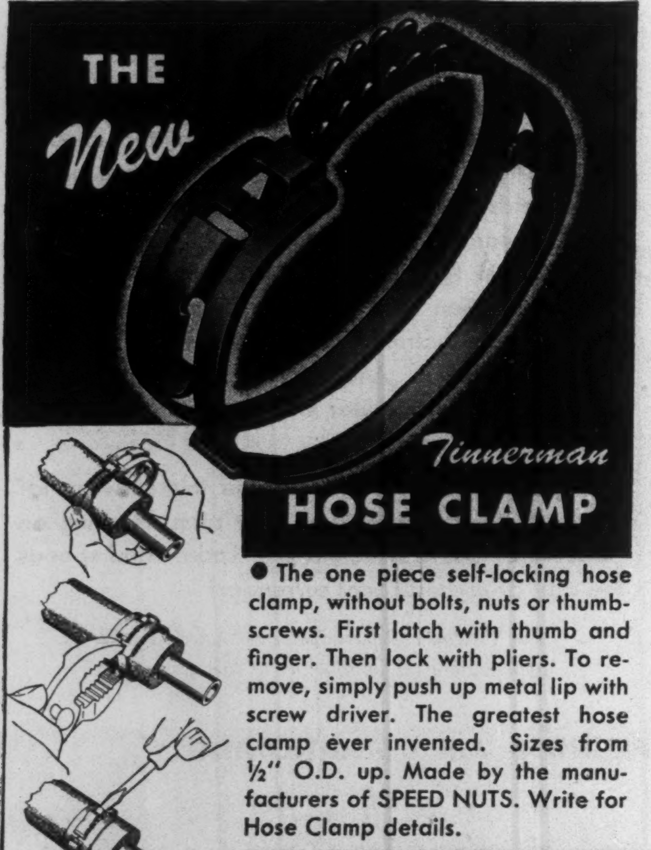
Application Engineers in Principal Cities

YOUNG

HEAT TRANSFER ENGINEERS

Manufacturers of Oil Coolers • Gas, Gasoline, Diesel Engine Cooling Radiators • Intercoolers • Heat Exchangers • Engine Jacket Water Coolers • Unit Heaters • Convectors • Condensers • Evaporators • Air Conditioning Units • Heating Coils • Cooling Coils • and a Line of Aircraft Heat Transfer Equipment.



• The one piece self-locking hose clamp, without bolts, nuts or thumbscrews. First latch with thumb and finger. Then lock with pliers. To remove, simply push up metal lip with screw driver. The greatest hose clamp ever invented. Sizes from ½" O.D. up. Made by the manufacturers of SPEED NUTS. Write for Hose Clamp details.

TINNERMAN PRODUCTS, INC.
2018 Fulton Road • Cleveland 13, Ohio

General Electric Co.; quick freezing performance of an experimental subzero food freezer, by Prof. J. E. Nicholas, Pennsylvania State College; the future of commercial freezing, by Richard C. Poole, General Foods Corp.; powder metallurgy, by A. J. Langhammer, Airtemp Div., Chrysler Corp.; refrigeration for penicillin manufacture, by Clifford F. Holske, Vilter Mfg. Co.; and refrigeration as applied to lyophilization, by George A. Belsky, Mance Corp. Headquarters office of the ASRE is at 50 W. 40th St., New York 18, N. Y.

Warm Air Heating

National Warm Air Heating and Air Conditioning Association, winter meeting, December 13-14, Statler Hotel, Cleveland. Headquarters office of the NWAHACA is at 145 Public Square, Cleveland, Ohio.

Heating and Ventilating Engineers

American Society of Heating and Ventilating Engineers, 51st annual meeting, January 22-24, Hotel Statler, Boston. For details, see ASHVE Journal Section in this issue. The secretary of the ASHVE is A. V. Hutchinson, 51 Madison Ave., New York 10, N. Y.

Testing Materials

American Society for Testing Materials, spring meeting and committee week, February 26-March 2, Hotel William Penn, Pittsburgh. Annual meeting, June 25-29, New York, N. Y. The ASTM headquarters office is at 260 S. Broad St., Philadelphia 2, Pa.

Statement of Ownership and Management of HEATING, PIPING & AIR CONDITIONING for October 1, 1944

The following is a statement of ownership, management, etc., as required by the Acts of Congress of August 24, 1912, and March 3, 1933, of Heating, Piping & Air Conditioning, published monthly at Chicago, Ill., for October 1, 1944:

State of Illinois, County of Cook, ss.: Before me, a Notary Public in and for the State and county aforesaid, personally appeared F. P. Keeney, who, having been duly sworn according to law, deposes and says that he is the Publisher of Heating, Piping & Air Conditioning, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business manager are:
Publisher, F. P. Keeney, Chicago, Illinois.
Editor, C. M. Burnam, Jr., Chicago, Illinois.
Managing Editor, C. M. Burnam, Jr., Chicago, Illinois.
Business Manager, Chas. E. Price, Chicago, Illinois.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.)

Keeney Publishing Company, 6 North Michigan Avenue, Chicago 2, Illinois. Stockholders: F. P. Keeney, Chicago, Illinois; W. J. Osborn, Fairfield, Conn.; R. P. Wettstein, Chicago, Illinois; Chas. E. Price, Chicago, Illinois; Robert A. Jack, Cleveland Heights, Ohio.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: None.

4. That the two paragraphs next above, giving names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company, but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

F. P. Keeney, Publisher.

Sworn to and subscribed before me this 18th day of September, 1944.

Grace E. Waymire.

(SEAL) [My commission expires February 10, 1946]

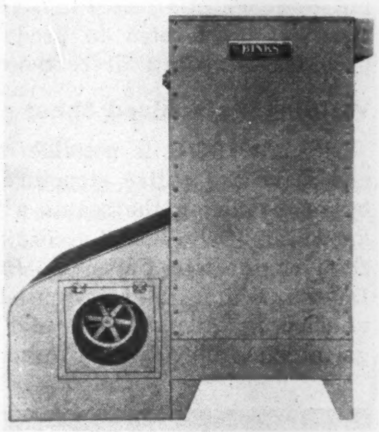
EQUIPMENT DEVELOPMENTS

For your convenience in obtaining more information about any of this equipment, see coupon on this page. Add the new products and companies listed here to your Directory Section which you received in your January 1944 Heating, Piping & Air Conditioning and thus keep your records of sources of supply up to date throughout the year. Single asterisk indicates equipment not listed in Directory Section; double asterisk equipment and manufacturer not listed.

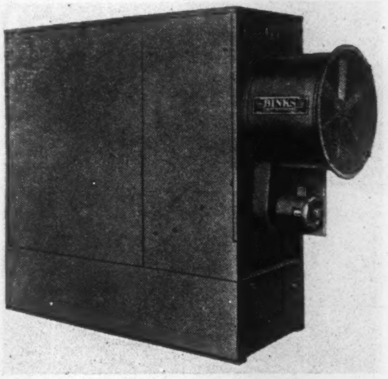
Two Cooling Towers

No. 2735—The cooling equipment division of the Binks Mfg. Co., 3114-40 Carroll Ave., Chicago 12, Ill., has announced two series of small and medium capacity mechanical draft cooling towers that are designed for either indoor or outdoor operation.

The first is said to be "a new departure in small cooling tower design, in which the air propulsion unit consists of a slow speed, double inlet blower resulting in exceptionally quiet operation." This tower is produced in five frame sizes suitable for the water cooling needs of refrigeration condensers up to 20 tons capacity.

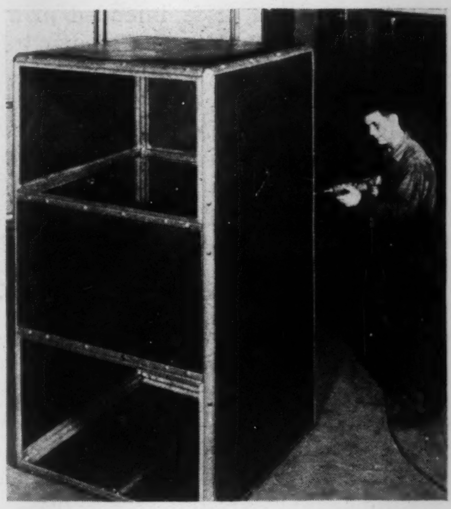


The second is a horizontal, induced draft cooling tower in which the air inlet supply is obtained through the rear, using aluminum alloy, propeller type, induced draft fans. These towers, in single fan assemblies, are produced in eleven frame sizes for capacities up to 150 gpm, and in five twin fan frame sizes for capacities up to 300 gpm. They are recommended by their manufacturer for general water cooling applications, including air conditioning and refrigeration work. In the larger sizes the design is such that heat exchange coils may be located in the spray zone for the indirect cooling of soft water for diesel engine jackets up to limited horsepower ratings and for the cooling of quenching oil and the temperature control of various other fluids used in industrial processing.



Aluminum Structure for Cabinets

No. 2736—Lindsay & Lindsay, 222 W. Adams St., Chicago 6, Ill., is now manufacturing "Lindsay Structure" in aluminum as well as steel, according to an announcement last month. The aluminum structure offers a 50 to 60 per cent weight saving over the light steel structure, yet possesses the same unique strength-weight ratio and ease of assembly features, it is stated. It is manufactured as a complementary product and not to replace the steel product.



Made of 61 ST alloy, the aluminum structure with panel sheets of 0.020 or 0.025 in. thickness "possesses adequate rigidity for a wide variety of uses, such as cabinets for many types of electrical and electronic equipment, LCL shipping containers for air cargo, refrigerator units, food processing equipment, small machine housings, and similar applications." The company is also manufacturing aluminum structure for truck and trailer bodies using sheets of 0.030 in. thickness.

The company points out that the inherent characteristics of aluminum make it peculiarly adapted to the method of assembly, which "draws the panel sheet into minutely uniform tension between framing members and creates a union which approximates the full strength in the sheet. It is this uniform pre-tensing of the sheet which utilizes the great strength in light sheet metal and gives the structure its extraordinary strength-weight ratio."

Tankless Water Heater

No. 2737—A new heater of the "instant" type, designed especially to provide a large volume of hot water over periods of peak demand is described in a new data sheet just issued by Taco Heaters, Inc., 342 Madison

Heating, Piping & Air Conditioning, [12-44]
6 N. Michigan Ave., Chicago 2, Ill.

Please ask the manufacturers to send me more information about the equipment mentioned under the following reference numbers in Equipment Developments and Recent Trade Literature.

(Circle each number in which you are interested)

2735	2736	2737	2738	2739	2740	2741	2742	2743	2744
2745	2746	2747	2748	2749	2750	2751	2752	2753	2754
2755	2756	2757							
4836	4837	4838	4839	4840	4841	4842	4843	4844	4845
4846	4847	4848	4849	4850	4851	4852	4853	4854	4855
4856	4857	4858							

Name ....Title............

Company ....

Address ....

City ....State............

Ave., New York 17, N. Y. Using boiler water as the heating medium, it is intended primarily to meet domestic hot water demands of apartment houses, clubs, smaller institutions, and business buildings, but is also provided in smaller sizes for two-family dwellings.

Eight sizes are offered, with capacities ranging from 175 to 900 gph of water heated from 40 to 140 F with boiler water at 180 F, or 350 to 1530 gal with boiler water at 212 F. These heaters, cylindrical in shape, offer an added advantage of compactness.

Electronic Temperature Recorder-Controller

No. 2738—An electronic type resistance thermometer suitable for indicating, recording, and controlling temperatures between —100 F and 1000 F has been announced by the Bailey Meter Co., 1050 Ivanhoe Rd., Cleveland 10, Ohio. This recorder "operates on the highly accurate null balance principle and provides instantaneous balancing action by electronic detection and control." Unbalance of the measuring bridge is detected by electron tubes without the aid of a galvanometer or other moving parts. Reliable performance and accurate calibration over long periods of continuous operation are said to result from this sturdy design.

These resistance thermometers may be provided with as many as four recording pens, each one with its own continuously connected electronic control unit and measuring bridge. This feature insures instantaneous response to changes in temperature.

The temperature sensitive element is a platinum resistance wire, wound on a mica form and held between two mica sheets which are clamped by a metal frame. The element is further protected by a well which is permanently installed in the pipe line, furnace wall, duct, or other point of temperature measurement.

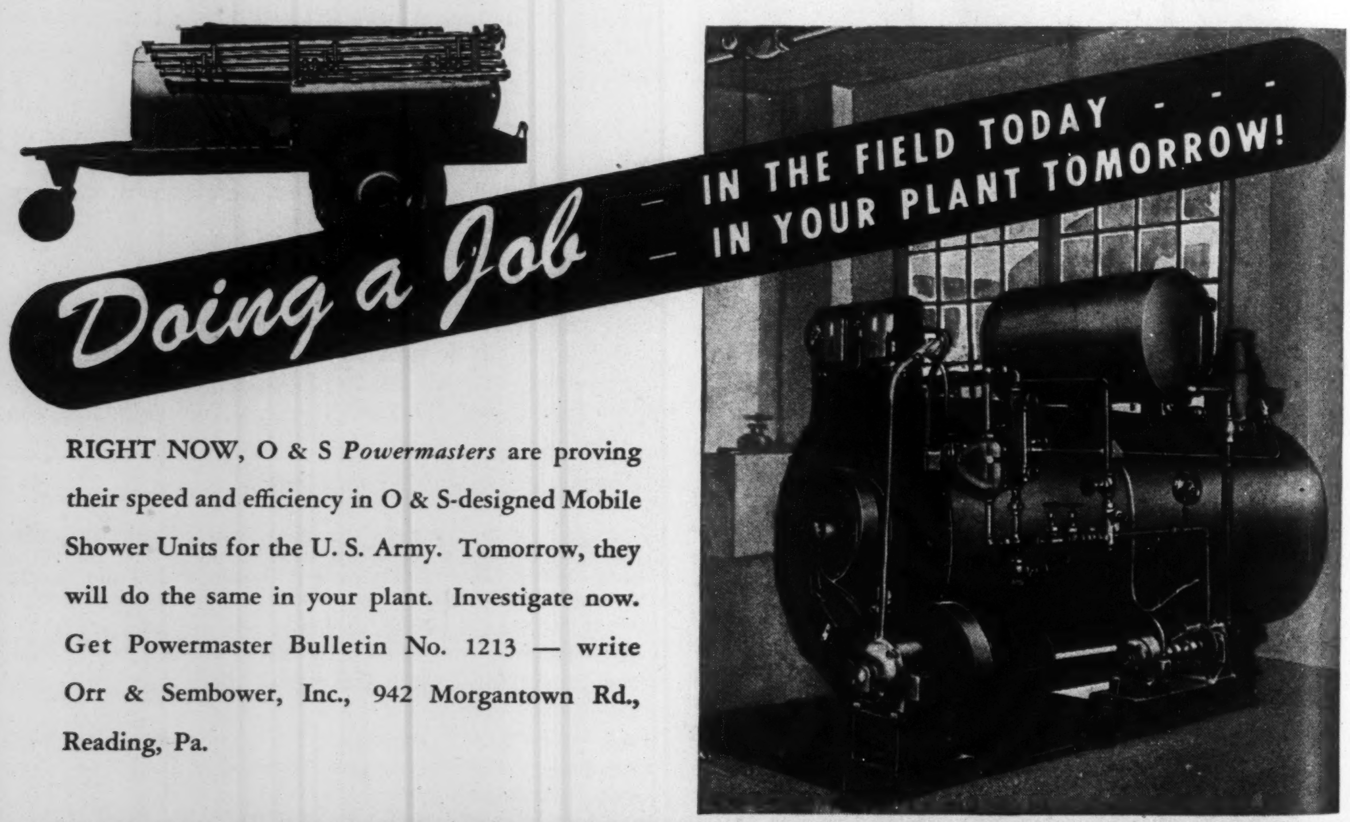
Postwar Heating Equipment Planning

No. 2739—Surface Combustion, 2375 Dorr St., Toledo, Ohio, has purchased the building adjacent to its Columbus, Ohio, factory in preparation for substantial increases in postwar employment and production on heating equipment, Frank H. Adams, general manager of the company, announced last month.

The newly-acquired building adds 130,000 sq ft, doubling production space of the Columbus factory where all "Janitrol" gas fired domestic furnaces and commercial unit heaters were made before the war, according to Mr. Adams. The building purchased is the former Lamneck Products, Inc., factory, a four story structure, which will be altered and connected with the present factory at 400 Dublin Ave. by enclosing the connecting areaway. New and present facilities will be devoted to production of space heating products, including aircraft heaters.

Welding Galvanized Sheet

No. 2740**—It is possible to weld galvanized sheet and leave the entire structure permanently rustproof by regalvanizing the seams with an alloy and process known as "Galv-Weld," according to George H. Ohmer, chief engineer of Galv-Weld Products, 304 E. 2nd St., Dayton, Ohio. In its essentials, this process consists of rubbing over the hot weld a stick of low melting galvanizing alloy "which forms thereon a smooth coat-

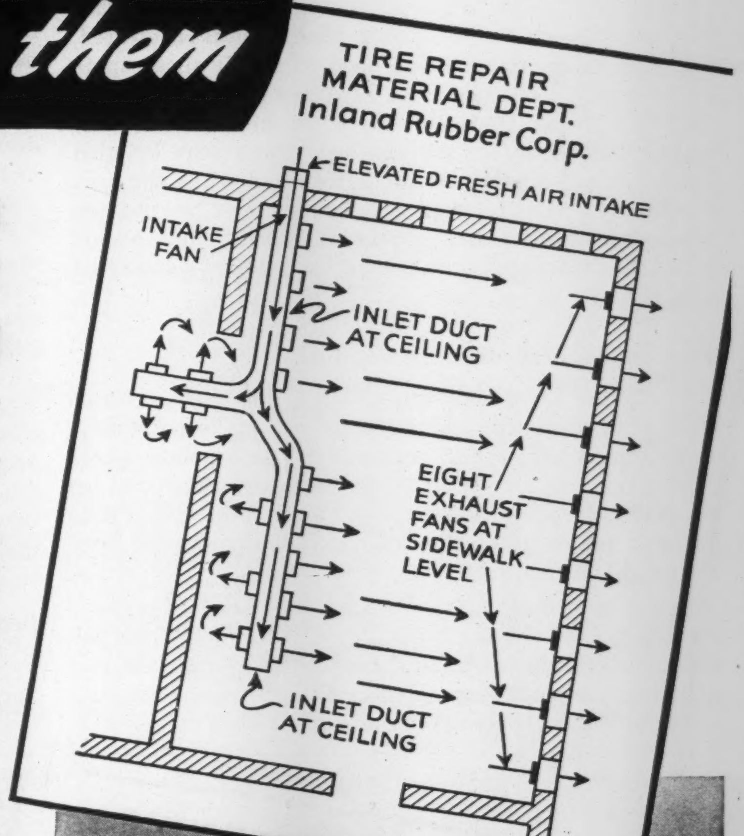


RIGHT NOW, O & S *Powermasters* are proving their speed and efficiency in O & S-designed Mobile Shower Units for the U. S. Army. Tomorrow, they will do the same in your plant. Investigate now. Get Powermaster Bulletin No. 1213 — write Orr & Sembower, Inc., 942 Morgantown Rd., Reading, Pa.

ORR & SEMBOWER INC.
READING • PENNSYLVANIA
O&S
Builders of Better Boilers
Since 1885

How to Prepare for MORE WORKERS ...and keep them

INLAND RUBBER CORPORATION BROKE A PRODUCTION BOTTLENECK WITH *MODERN VENTILATION*



Eight months ago, Inland Rubber Corporation of Chicago broke the bottleneck in their tire repair material department with this simple installation of Propellair ventilating equipment.

Demand for Inland vulcanizing sections—vital to the daily operation of American and Allied combat vehicles—was soaring, but there was no space for expansion. Fumes and haze from hot presses and from the buffing and cementing operations made working conditions unpleasant, labor turnover high. Ventilation was the obvious need. But *how?* Low ceilings prevented elaborate duct work.

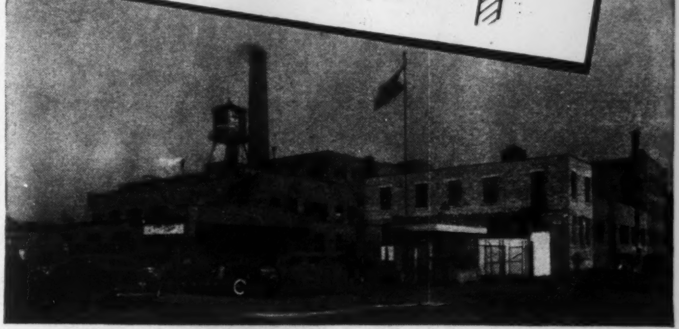
Transforming this area into a comfortable environment for *two and one-half times* the number of previous employees was not at all difficult for Propellair engineers. A single duct with an elevated outside intake now introduces fresh air at several points along one inside wall, and all or any of eight exhaust fans in street-level windows complete the ventilating circuit by drawing air across the room.

Higher Morale, Immediately

Inland workers responded immediately. Morale and output rose in these comfortable, healthful surroundings, and Inland management is highly pleased that Propellair ventilation enabled them to step up production without physical expansion. Only once has the system been down—due to electricity failure—and when started again it cleared the air in less than three minutes.

There are other Propellair installations at the Inland plant, but none can better demonstrate the benefits of modern industrial ventilation or the advantages of compact Propellair design, which in this case, as usual, takes up no working space at all.

Let Propellair engineers show you how simply and easily you can apply these high-capacity, low-horsepower, airfoil-propeller fans in your present and prospective operations. Send for Catalog No. 10. There are Propellair distributors in 25 principal cities.



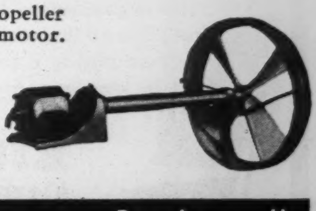
Plant of Inland Rubber Corporation, only tire factory in Illinois.

THESE ARE THE FANS . . .

Like all Propellair fans, those at Inland Rubber Corporation are of the axial-flow type with highly efficient airfoil-section blades and airfoil-principle curved entrance rings. This modern equipment delivers maximum air volume from minimum horsepower; permits easy, simple installation; requires little space. These two types are used in the Tire Repair Material Department:

Exhaust Fans: 30"-diam., 2-blade propeller equipped with ¼-H.P., 1750-r.p.m. motor. Type CD-30D.

Intake Fan: 24"-diam., 4-blade propeller with shaft extended to locate 2-H.P., 1750-r.p.m. motor outside airstream. Model CE-24M.



PROPELLAIR, *Inc.* "Moving Air is our Business"
SPRINGFIELD · OHIO

ing of metal which will have all of the corrosion resisting properties as well as the wearing qualities of the original galvanized coating."

The problem of manufacturing and installing corrosionproof duct systems for air conditioning and solvent recovery is simplified by this method, it is stated.

Oftentimes skips and blemishes are found in galvanized sheet used for ductwork that, unless protected, will rust. The alloy can be used to repair these spots by heating the surface to be repaired to approximately 600 F with an acetylene torch or other convenient means. The area is then brushed with a wire bristled brush to remove scale or impurities, and while the spot is still hot a bar of the alloy is rubbed over the surface "thus depositing a new rustproof coating that blends with the surrounding hot dip or electro-galvanized coating."

Plans Simplified Cooling Products

No. 2741—A "streamlined" program for postwar product development and redesign will make possible a reduction as high as 25 per cent in the number of refrigeration and air conditioning items manufactured by the York Corp., Roosevelt Ave., York, Pa., one of the nation's major producers of such equipment, it was reported last month.

Speaking before a meeting of the Sales Managers Association of Philadelphia, W. S. Stair, director of product development for the company, declared that one of the major postwar problems of the refrigeration and air conditioning industry at present is that of simplification and reduction in number of types and sizes of equipment without loss of either markets or potential applications.

"There are some 50 major markets for our products and in order to cover these markets we build 55 different classes of commodities which, when broken down in various sizes, represent 400 different items, not including parts," Mr. Stair explained. The present policy, he said, is centered on establishing a list of postwar commodities which will include some of the present products without change, others of the present line redesigned for lower costs, better performance and standardization, and a certain group of entirely new products.

"Practically every refrigeration or air conditioning system or unit which we build incorporates some type of gas pumping means and heat transfer surface. This is true whether it be a small portable air conditioner or a refrigerating system for a vast cold storage plant. Therefore, while our development engineers have been striving for more compact, efficient, and lower cost component parts which may find use in a wide variety of unitary equipment, we have been conducting market studies which will help us to make a final decision to incorporate these components into finished models and make capital expenditures for tools and plant alterations as may be found necessary," he said.

Protractor for Marking Pipe

No. 2742**—Pipe, structural shapes, and flat sheets "are quickly and accurately scribed for cutting on any angle to one-half of a degree" with the "Trumark Pro-

SOMETHING NEW HAD BEEN ADDED!

Forty-one years before the 19th Amendment permitted national women's suffrage, fair voters were casting ballots in municipal elections at the Massachusetts polls. In steam engineering, too, in 1879, something new had been added. Tim Kieley introduced the steam trap...the daddy of them all. For 3 generations since then, K&M Specialties have benefitted from this pioneering headstart. Today's K&M Type 554 combination Back Pressure and Atmospheric Relief Valve is an example. In any service where constant pre-determined back pressure and absolutely tight shut-off are required, this water-sealed valve is *guaranteed* against leakage or back flow. Sizes from 2" to 24", to handle pressure from 2 to 30 lbs. without pounding or chattering. Installation may be vertical or horizontal; pressure setting is easily adjusted; servicing, when necessary, is extremely simple. Type 554 may be *your* answer to an unsolved problem.

Do you have our General Catalog #66? Write for it.

KIELEY & MUELLER, INC.
MANUFACTURERS OF PRESSURE AND LEVEL CONTROLS SINCE 1879
NORTH BERGEN, NEW JERSEY

heart trouble – (in appliances) Any failure of the electric motor which inconveniences and aggravates the owner.

"Lady, you don't have to do that!"

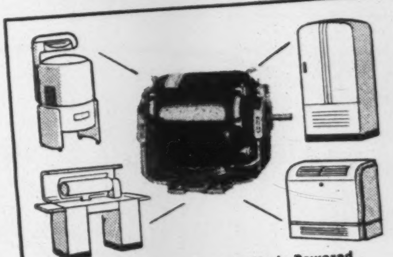
There's no "heart trouble" in that appliance—*it has an* EMERSON-ELECTRIC MOTOR

Of course, no woman is going to take along a stethoscope when she buys a motor-driven electric appliance. But this much is true—what the *heart* is to the human body, the *motor* is to the appliance. It's just smart buying and good common sense to make sure you get a strong, reliable motor—a motor that is precision-built to give QUIET, uninterrupted operation.

If the motor in your appliance is an Emerson-Electric, you can be *sure* it *will* give you long, faithful service. Because Emerson-Electric Motors are made by the same people who make the famous Emerson-Electric Fans—many of which have been in operation 25 years and longer!

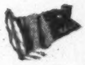
So, when you buy these new home appliances, ask "Do they have Emerson-Electric Motors?"

Are you going to modernize or build a new home? Write today for complete information on Emerson-Electric Kitchen Ventilating Fans and Home Cooler Fans.



The American Way of Life is Powered with Electric Motors

For more than 54 years Emerson-Electric Motors have been providing dependable power for many of America's best-known appliances, and helped to build the reputation of their makers.



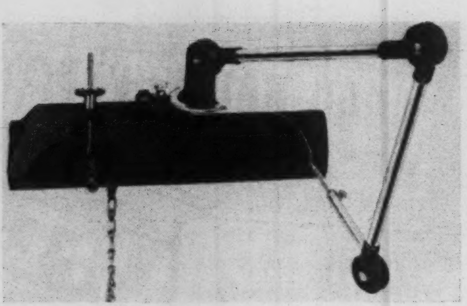
THE EMERSON ELECTRIC MANUFACTURING CO.
ST. LOUIS 3, MISSOURI
Branches: New York • Chicago • Detroit • Los Angeles • Davenport

EMERSON ELECTRIC
MOTORS · FANS
APPLIANCES

One of a series of advertisements appearing in National Magazines

If your future plans include the manufacture of motor-driven appliances it will pay you to investigate Emerson-Electric Motors—made to give long, faithful service without "heart trouble."

419

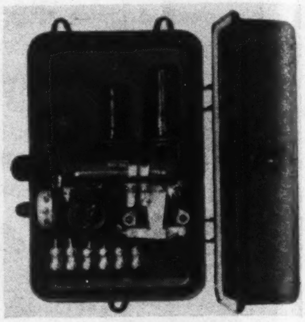


tractor" which, on allocation of materials, is again being manufactured by the Tru-Line Corp., 759 Venice Blvd., Los Angeles 15, Calif. It is made in two stock models, three sizes. The one illustrated scribes the circumference of pipe 3 to 18 in. in diameter. It is placed on the pipe parallel to the centerline, leveled by means of a built-in spirit level, locked in place with a spring chain, adjusted to the desired angle by means of the 180 deg scale, and the scribing completed. It is made of precision-machined cast bronze alloy and steel tubing. The joints contain special fiber bearings which "hold the correct tension and maintain positive alignment." Another size of this model marks pipe 12 to 36 in. in diameter, and a junior size marks pipe or rod ½ to 3 in. in diameter. It is of die cast construction.

For use on flat surfaces, channel iron, T or I structural shapes, the protractor is set up as on pipe, or held square to any edge or corner. A plumb bob indicator and spirit level show any degree of angle from a horizontal plane.

Control Checks Liquid Mixtures Electronically

No. 2743—Photoswitch Inc., 77 Broadway, Cambridge 42, Mass., has announced an electronic concentrate control for detecting and controlling, through operation of signals, valves, or pumps, changes in liquid concentrations. It provides "precise and accurate control" for all applications in which changes in concentration are accompanied by a corresponding change in electrical conductivity.



Installation requires that a probe fitting be mounted on the tank, with probe extending into the liquid. This probe is wired to the electronic control which may be located wherever desired. An adjustment on the control housing is set so that the control relay will operate when liquid of a predetermined electrical resistance contacts the probe. While the probe is immersed in liquid of any other resistance, the control remains inoperative, but when a change in concentration alters the conductivity of the liquid to the necessary degree, the electronic control relay is energized to operate signals, valves, or pumps.

An interesting application of this control is the detection of contamination in boiler condensate. A large smelting company, for example, uses condensate to heat coils containing an acid electrolyte. As a leak in

Season's Greetings

A NEW IDEA IN RADIANT HEATING

DESPITE the fact that the major portion of our efforts the past few years have been devoted to War Work, we MADE time to develop improved and new ideas in connection with Heating Equipment.

In the near future we expect to announce an entirely new and different heat distributing unit which will place Radiant Heating (which is already accepted as the finest type of heating) so far ahead of other types of heating that it cannot be considered other than in a class by itself.

It will produce comfort you never dreamed possible.
It will be out of the way and practically invisible.
It will maintain more comfortable lower room temperatures.
It will be located where the greatest heat loss takes place.
It will last as long or longer than the building in which it is installed.
It will be easy to install.
Its cost will be very nominal.
Watch for future announcements.

Season's Greetings

Burnham Boiler Corporation

ARMY E NAVY
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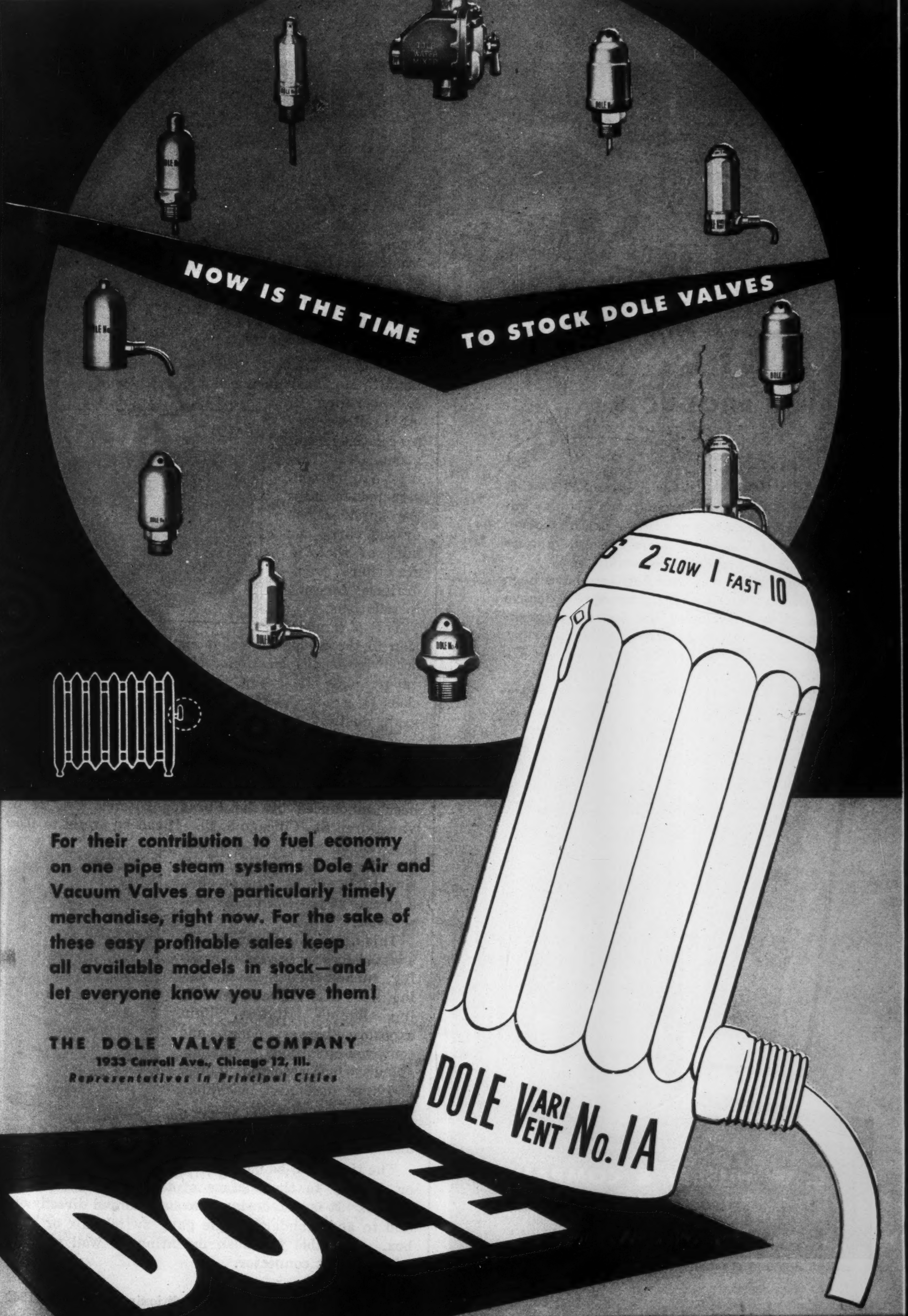
Export Dep't 50 Church St., New York 7, N. Y.


NOW IS THE TIME TO STOCK DOLE VALVES
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DOLE VARI VENT No. 1A
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For their contribution to fuel economy on one pipe steam systems Dole Air and Vacuum Valves are particularly timely merchandise, right now. For the sake of these easy profitable sales keep all available models in stock—and let everyone know you have them!

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THE POST WAR SHAPE OF
THINGS TO COME . .

will be better, because of

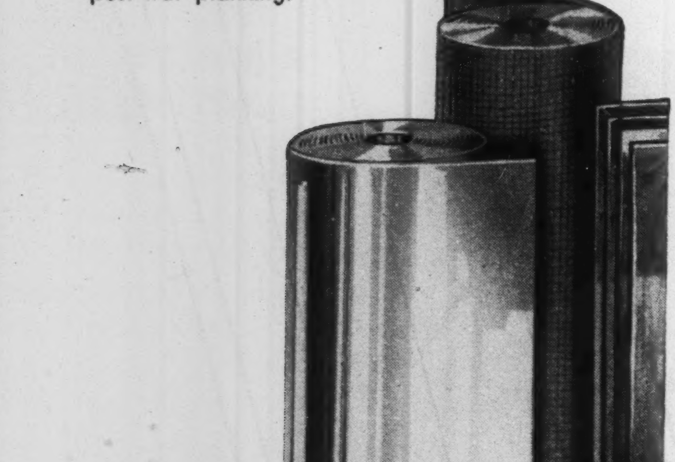
HUSSEY *War Developed*

COPPER PRODUCTS . . .

When the ticker spells out P-E-A-C-E, the HUSSEY organization will play another important role *as one of America's leading sources of Copper for more efficient, gracious living in tomorrow's copper world.*

Many aggressive manufacturers have been exploring every possibility for more extensive use of war-developed and improved copper products that will provide greater economy, utility and efficiency in their post-war products.

You, too, can profitably use Hussey engineering facilities for practical, experienced aid in post-war planning.



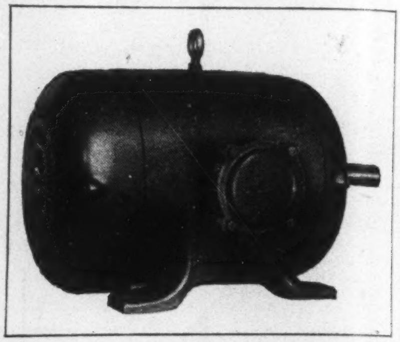
C. G. HUSSEY & COMPANY
(Division of Copper Range Co.)
Rolling Mills and General Offices: PITTSBURGH, PA.
Warehouses in Principal Cities

the coils permits the acid to mix with the condensate and renders it unfit for return to the boilers, it is necessary to detect and control such leakage. The addition of the acid to the water increases its conductivity and this change is detected by the electronic control. An alarm is sounded and a three-way motorized valve operates to remove the contaminated condensate.

This type of control is also used wherever it is necessary to maintain an interface between two liquids differing even slightly in electrical conductivity. Electronic operation thus permits single or two level control of one liquid within a tank, even though another liquid may be above or below it.

Explosionproof Motor

No. 2744—Century Electric Co., 1806 Pine St., St. Louis 3, Mo., has announced a new explosionproof motor for operation in ethyl ether vapors (class I, group C). This motor is constructed to meet the specifications of and carry the label of the Underwriters Laboratories for such installations.



This is in addition to the company's other explosionproof motors for other hazardous locations: class I, group D, gasoline vapor; class II, group E, metal dust (magnesium); class II, group F, carbon black; and class II, group G, grain dust.

Industrial Timer

No. 2745—A new manually preset interval timer has been announced by the Paragon Electric Co., 37 W. Van Buren St., Chicago 5, Ill. It can be preset to allow a given operation to continue for almost any predetermined time limit and to close or open a circuit at the end of the preset time.

This unit is particularly well adapted for use in plastic molding, rubber curing, batch mixing, heat treating, enamel baking, liquid agitation, light exposure, blower, pump, and conveyor operations, watchman signals, food cooking, power and light disconnect, machinery operation, control of ventilating fans on a preset schedule, and night heating shutdown, says the manufacturer.

The timer can be mounted to the surface of any panel or directly to the surface of the equipment it is to control. It is also designed to be mounted directly over and to any standard single gang switch box or handy box. Available for flush mounting or wall mounting with conduit connector.

More Power Needed!

In adding still more lathes, millers, and other machine-tools to our line-up, and taking additional power off the line shaft, we've run into trouble. The belts in use from our 50 H.P. Motor 10 feet away, were slipping and shuddering, slowing production. That's when we called the Dayton V-Belt Distributor.

He studied the problem, recommended that we pull in the motor to a 22 inch center distance, and supplied us with a 5" V-grooved pulley for the motor, and with 9 Dayton V-Belts to drive the flat pulley on the line shaft. Daytons did it. Since then we've run 12 hours a day for about 3 years, able to forget our Dayton Drives completely. Every Dayton V-Belt is still in good shape. You can hardly tell they've been used at all.

Called Dayton V-Belt Distributor—

OK

Call Your Dayton V-Belt Distributor He'll Bring You Better Drives, Too

He doesn't care if your problem is tough. He doesn't care if you need only helpful suggestions, or if your job takes difficult calculations. Dayton V-Belt Distributors are practiced, experienced, and competently able to help you solve power transmission problems.

He's familiar with all the better-gripping, smoother flowing, longer lasting advantages you get from Dayton V-Belts. And he is ready to furnish you with names of others like yourself, near-by, who are grateful for their Dayton V-Belt Drives.

He'll bring you every benefit of Dayton Rubber's thirty-eight years of specialized V-Belt experience, and of Dayton's Technical Excellence in the development of synthetic rubber. Call him. You can depend on his Dayton V-Belts, and accept his recommendations with confidence.

CALL YOUR DAYTON V-BELT DISTRIBUTOR OR WRITE DIRECT

THE DAYTON RUBBER MFG. CO., DAYTON 1, OHIO
The World's Largest Manufacturer of V-Belts
Export Division: DAYTON RUBBER EXPORT CORPORATION
38 Pearl St., New York, N.Y., U.S.A. *Cable Address:* WIDBLOCO

MAINTAIN VICTORY SPEEDS—CONSERVE YOUR TIRES

V-Belts by

Dayton Rubber

REG. TRADE MARK THE DAYTON RUBBER MFG. CO.

The Mark of Technical Excellence in Synthetic Rubber

AIRTHERM UNIT HEATERS

Now Available with Copper Coils

Available on AA5, or Better, Priority

Horizontal Unit Heaters

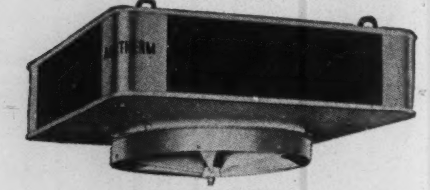
(Copper)

CAPACITIES

		Motor			Final
Model	Btu/hr.	HP	RPM	CFM	Temp. °F.
M-25C	25,400	1/45	1580	410	114
M-35C	35,000	1/33	1580	585	114
M-45C	45,000	1/33	1580	685	118
M-60C	60,000	1/20	1140	1020	114
M-87C	87,000	1/8	1140	1500	113
M-114C	114,000	1/8	1140	1905	114
M-140C	140,000	1/6	1140	2400	113
M-170C	170,000	1/6	1140	2650	118
M-215C	215,000	1/4	1140	3600	114
M-278C	278,000	1/2	1140	4300	118

Btu/hr. computed at 2 lb. gage steam pressure and 60°F. entering air.

Vertical Delivery Unit Heaters



CAPACITIES

		Motor			Final
Model	Btu/hr.	HP	RPM	CFM	Temp. °F.
V-145C	145,000	⅛	1140	2700	114
V-175C	175,000	⅓	1725	3400	111
V-191C	191,000	¼	1140	3300	118
V-234C	234,000	½	1725	4300	114
V-260C	260,000	½	1140	4550	115
V-340C	340,000	½	1140	5600	120
V-480C	480,000	1	1140	8000	120
V-600C	600,000	1½	1140	11000	115

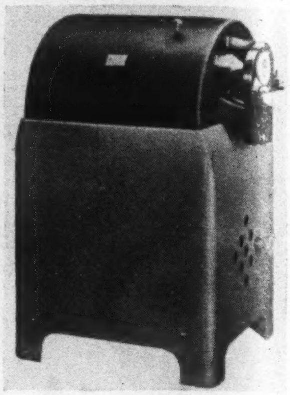
Send today for bulletin giving complete information and prices.

AIRTHERM

MANUFACTURING COMPANY

711 South Spring Avenue • Saint Louis 10, Missouri

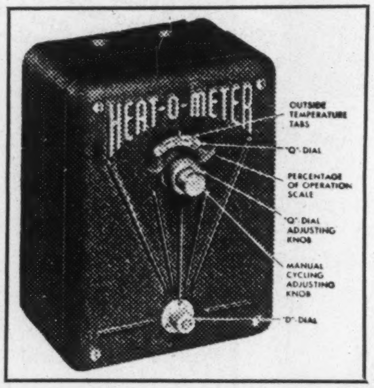
Automatic Tubing Machine



No. 2746**—A completely automatic "Tube Master" for squaring, burring, flaring, and beading ferrous and nonferrous tubing, sizes ⅛ to 3 in. OD, is now available, according to M. E. Wartnik, Leonard Precision Products Co., 1100 Larson Ave., Garden Grove, Calif.

The operator places the tube in position and presses the control button. The machine automatically completes the cycle. Uniformity of finish can be maintained indefinitely to exact predetermined specifications, it is stated.

Heating Control for Multiple Occupancy Buildings



No. 2747—A new control for regulating the operation of commercial stokers and oil burners used to heat apartment, office, factory, and other multiple occupancy buildings has been announced. With this control, the percentage of time the burner operates and the frequency of operation is regulated in accordance with outside temperature and weather conditions. The fireman "can readily adjust the control to provide almost any operating cycle he wishes." Fuel savings of up to 35 per cent with average savings of 15 to 20 per cent are claimed by the manufacturer.

This "Heat-O-Meter" is so-called because it delivers "metered heat impulses" which keep constant heat in the radiators during cold weather and maintain uniform temperatures throughout the building during mild as well as cold weather. The manufacturer is the Miller Heat-O-Meter Co., 4385 N. Green Bay Ave., Milwaukee 12, Wis.

Industrial Humidifier

No. 2748—In answer to a demand from large industrial plants who made initial tests with "Skilbeck" humidifiers in smaller areas, a new cluster type has been developed for large industrial spaces. It is available in multiples from two to 16 humidifiers, with a capacity range from approximately 240 to 1820 gal per 24 hr period, taking care of areas from 80,000 to 640,000 cu ft of enclosure. It is operable on pressures ranging from 1 to 20 lb.

This humidifier is distributed nationally by Techtmann Industries, Inc., 828 N. Broadway, Milwaukee 2, Wis.

Merry Christmas

SPANG-CHALFANT

Division of The National Supply Co.

Executive Offices: Pittsburgh, Pa.

District Sales Offices: Atlanta; Boston;
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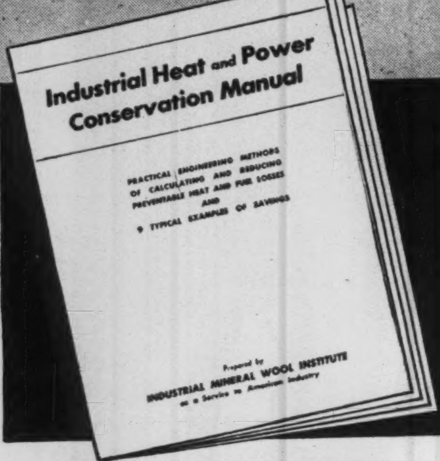
FREE—Manual tells how you can SAVE HEAT AND POWER


Industrial Heat and Power Conservation Manual
Practical engineering methods of calculating and reducing preventable heat and fuel losses and 9 typical examples of savings
Prepared by Industrial Mineral Wool Institute as a Service to American Industry

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Here's a book that you need. It is filled with money and fuel saving suggestions. Nine case studies are covered. Some of them probably apply to your plant equipment. Look it over carefully. Use the practical survey form which accompanies the manual. Check your own savings.

You can realize these savings in your own plant with Mineral Wool Insulation because it has extraordinarily low thermal conductivity. It is easy to apply because it is light and comes in six convenient forms. Can be fitted to irregular areas. It is non-critical—always available.

Cooperate with your government's drive to save critical fuel. Stop heat losses now. Send for your copy of this free manual today. Industrial Mineral Wool Institute, 441 Lexington Avenue, New York 17, N.Y. Dept.H-12.

IF IT'S TOO HOT TO TOUCH IT NEEDS INSULATION

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Mineral Wool Insulation is effective also for controlling cold temperatures and is an excellent fire-repellent.

MINERAL WOOL INSULATION PRODUCTS for high and low temperatures

BLANKETS · FELTS · BLOCKS · CEMENTS · PIPE COVERINGS · FILL MATERIALS

Concrete Refrigerated Cargo Carrier

No. 2749—The "first all-concrete refrigerated cargo carrier, a floating icebox which will supply U. S. invasion troops with fresh food during initial landing operations," has been completed and is in action somewhere in the south Pacific.

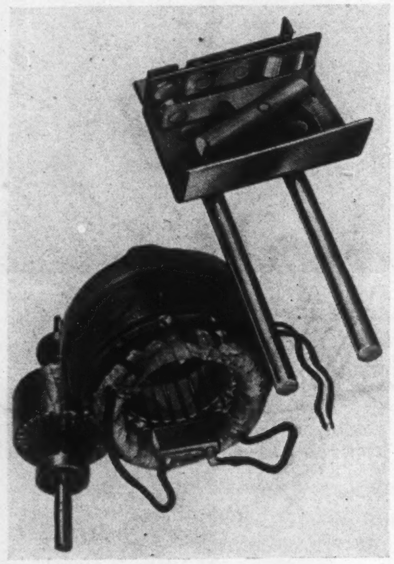
Engineered and equipped by the York Corp., Roosevelt Ave., York, Pa., with a unique cold storage system for fresh meat and produce, the new refrigerated barge is one of three such vessels to be built for the U. S. Army in the yards of the Concrete Ship Constructors. More than 1000 tons of fresh meat, fruits, ice, and ice cream were carried by the vessel on her maiden voyage.

The vessel is 265 ft long with a 48 ft beam. The concrete walls of the hull are 5 in. thick. Refrigerated storage capacity amounts to 122,000 ft and includes a plant capable of turning out 500 gal of ice cream a day while in a fighting zone, and another plant to produce 5 tons of ice daily. Altogether, the ship produces 53 tons of refrigeration every 24 hr.

The central portion of the deckhouse, 225 ft long, is virtually a huge refrigerator with thick walls heavily insulated and massive outside doors. Inside, a temperature of 32 to 36 F is maintained. Below decks, holds are kept at temperatures of 10 to 15 F for the length of a voyage to store meats, each hold by virtue of its insulation making an individual freezing compartment.

For quick action in battle zones, a monorail system of conveyors runs the length of the ship, its traveling crane and switches able to lift a 2 ton bite of cargo at a time. A total of 400 hp is developed by the ship's diesel engines which run the cranes, unloading equipment, refrigerating compressors, and other machinery.

Split-Phase Motor Starting Switch

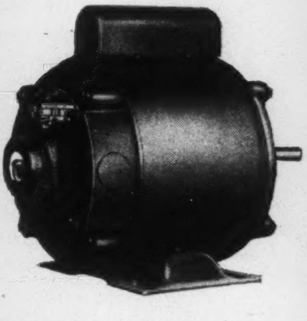


No. 2750**—A recently developed split-phase motor starting switch, made by the Borg-Erickson Corp., 469 E. Ohio St., Chicago 11, Ill., can be used for "split-phase," "capacity start-induction run" and "capacity start-capacity run" motors.

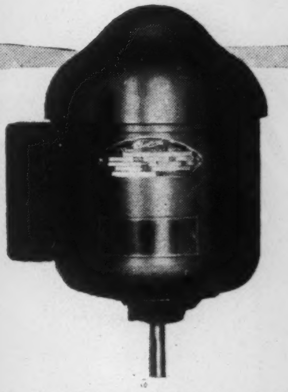
There are two primary patent claims which have been filed, says the manufacturer. An electrical motor operates through the application of *magnetic* power which is created by the electrical energy in the windings of the motor. The stator, therefore, becomes a highly concentrated source of magnetic power. The one patent claim deals with the extraction of that magnetic energy through two iron pole pieces. A flier is mounted on a shaft and held in an open position by a coil spring when the motor is

AIR CONDITIONING COMFORT

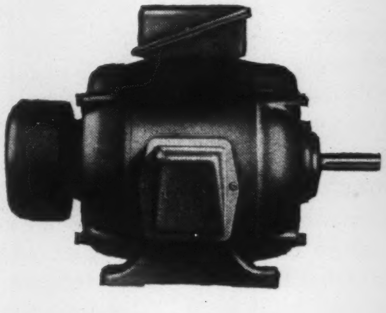
Demands the Quiet Operation of CENTURY Capacitor Motors



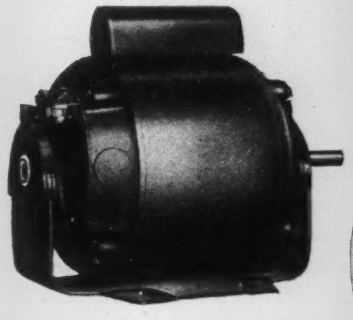
Rigid Base Capacitor Motor, 1/6 Horsepower, 1750 RPM.



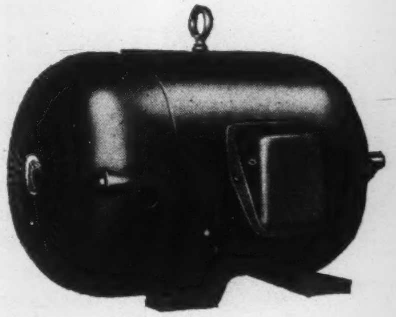
Vertical Capacitor Motor, 1/6 Horsepower, 3500 RPM, with face type end bracket.



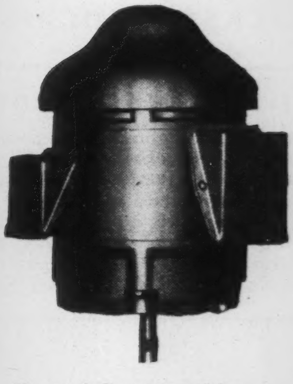
2 Horsepower, Horizontal, Capacitor Motor.



Cushion Base Capacitor Motor, 1/4 Horsepower, 1750 RPM.



Totally Enclosed Fan Cooled, Capacitor, 10 Horsepower Motor.



Vertical Capacitor Motor, 3 Horsepower, 3500 RPM.

Century motors for heating, ventilating, and air conditioning equipment are famous for their quiet operation. That's why so many of them are being used by the industry.

They start quietly—no quick jerks that create noise and wear out equipment. They come up to speed smoothly and easily, but with full power — yet without whines or groans. And they run just as smoothly and quietly throughout their long life.

For single phase applications, Century Capacitor motors are particularly well suited to automatically controlled constant or multispeed applications, such as: refrigeration compressors, furnace fans, blowers, stokers, pumps, unit heaters, coolers, and similar heating, cooling, and ventilating equipment.

Century engineers have had an unusual amount of experience in the air conditioning field, and are well equipped to help you select the correct motors to meet your needs.

Century motors are available up to 600 horsepower.

Call in a Century engineer today.

Century
C
MOTORS

CENTURY ELECTRIC CO., 1806 Pine St., St. Louis 3, Missouri

Offices and Stock Points in Principal Cities

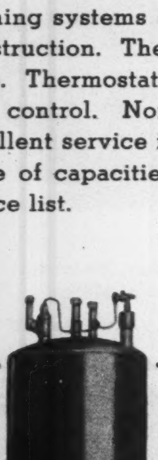
395

Dry-Ex
Water cooler

● These dry expansion water coolers are designed especially to meet the increasing demand for cooled recirculated water in air conditioning systems of the indirect type. Shell and tube construction. They require but a small refrigerant charge. Thermostatic expansion valves simplify refrigerant control. Nonfreeze. They are today supplying excellent service in hundreds of installations. A full range of capacities. Write for complete information and price list.

ACME INDUSTRIES
JACKSON, MICHIGAN

HI-PEAK WATER COOLERS
Where instantaneous high-peak delivery of cooled water is desired, Acme remote type water coolers assure ample reserve volume on demand at all times. Shell and coil construction, coils are properly sized to insure against excessive refrigerant pressure drop. Storage capacities: 12 to 168 Gal.—Write for Catalog No. 25.



ACME PRODUCTS
Write for Catalog on any item

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- Forced Convection Units
- Ammonia Condensers
- Freon Condensers
- Heat Exchangers
- Pipe Coils
- Flooded Water Coolers
- Hi-Peak Water Coolers
- Dry-Ex Water Coolers
- Heat Interchangers
- Oil Separators
- Liquid Receivers

ACME PRODUCTS

stopped and there is no current applied. The magnetic field is created instantaneously when current is applied. At that instant, the flier swings like a compass needle across the ends of the two pole pieces which extend into the case. This turning action closes the starting winding circuit by closing the two contact points.

One of the other patent claims is built around the swinging action of the flier. When the contact points close, the flier is able to *continue its swing* to the extent that it puts a definite bow in the spring and "*spring loads*" the contact points. This additional travel of the flier and the "spring loading" of the points which that permits are so great that "the contact points get absolutely no transmittal of a-c vibration (magnetic impulse)." Single units have made as high as 500,000 stops and starts with no indication of deterioration of the contact points or other parts, says the manufacturer.

Each switch is hermetically sealed and consequently makes the motor explosionproof as well as dust- and oilproof. This sealing eliminates possibility of motor failure and burnout ordinarily caused by dust and oil between the contact points and in the mechanism of a switch.

Locker Insulation

No. 2751—"Balsam-Wool K-25," a new insulating fiber for locker and cold storage plants, has been announced by the Wood Conversion Co., 1981 First National Bank Bldg., St. Paul 1, Minn.

It is shipped in bales. On the job, the fiber is fluffed to a low density and then hand packed in walls, floors, and ceilings. A special asphalt impregnation adds to the natural moisture resistant characteristics of the fiber, and also eliminates wick action, says the manufacturer.

Venturi Type Safety Valves

No. 2752**—Farris Engineering Co., Palisades Park, N. J., has announced the development of a line of venturi type safety valves "with special provisions for constant accurate blowoff, exceptional capacity, complete tightness of reseating, minimum escape of vapor into the surrounding space, and elimination of angular distortion and fouling," in the words of the manufacturer.

The inlet venturi tube nozzle of this design gives an unobstructed port and guided high velocity of the steam, which is said to result in high lift and capacity. One of the features is a patented "separator bell"; this device causes the steam to make three changes in direction before passing into the atmosphere, and includes a drain for the condensed moisture into the body. Escape of vapor into the air is thereby minimized. The separator bell also helps to keep the spring cool by preventing steam from striking the spring. Correct alignment of the stem, on which complete tightness of reseating depends, is further maintained by precision machine work throughout the valve, and by top guidance of the stem in two bearings.

Twin Spindle Chucking Machines

No. 2753—The Bullard Co., 286 Canfield Ave., Bridgeport 2, Conn., announced last month a new type

"WHAT'S THE ANSWER IN DOLLARS and CENTS

...if we modernize our boiler plant now?"

YOU enjoy immediate savings in fuel consumption, plus a substantial step-up in steam production, when you modernize with TODD burners.

Hundreds of plants have already modernized costly, inefficient boiler plants with TODD oil and gas burning equipment. *They report fuel savings up to 10% and more, with corresponding power increases.*

Operating economies like these are not unusual. For the over-all efficiency of the modern TODD burner, reflecting 30 years of sound engineering achievement, means *steam production at minimum cost*—a dollars-and-cents reason why NOW IS THE TIME TO MODERNIZE WITH TODD.

TODD combustion engineers are specialists in the modernization of industrial and commercial boiler rooms of all types. Why not call on them today . . . for an impartial survey of *your* plant . . . for suggestions, specifications, estimates. Their services are available at any time, without obligation.

ARMY E NAVY

COMBUSTION EQUIPMENT DIVISION

TODD SHIPYARDS CORPORATION

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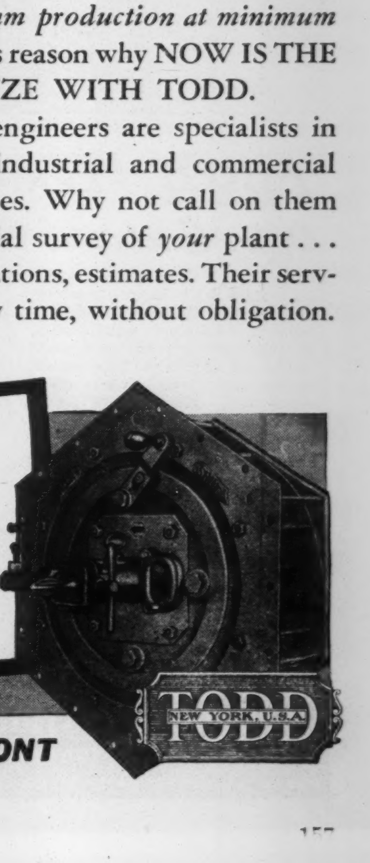
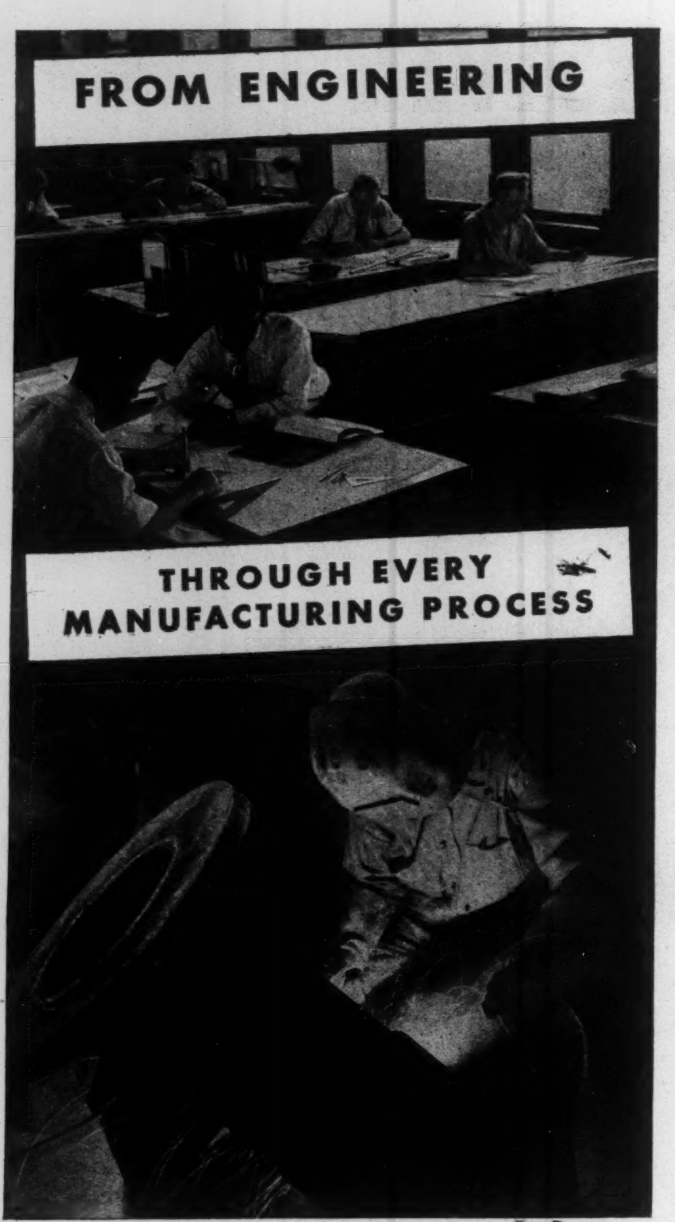
NEW YORK, BROOKLYN, ROCHESTER, HOBOKEN, NEWARK, BARBER, N. J., PHILADELPHIA, SO. PORTLAND, ME., BOSTON, SPRINGFIELD, MASS., BALTIMORE, WASHINGTON, CHICAGO, GRAND RAPIDS, TAMPA, GALVESTON, HOUSTON, MOBILE, NEW ORLEANS, LOS ANGELES, SAN FRANCISCO, SEATTLE, TACOMA, MONTREAL, TORONTO, BUENOS AIRES, LONDON



ON THE FIRING LINE OF AMERICA'S WAR PRODUCTION FRONT



ADSCO EXPANSION JOINTS

Offer Exclusive Built-in Features

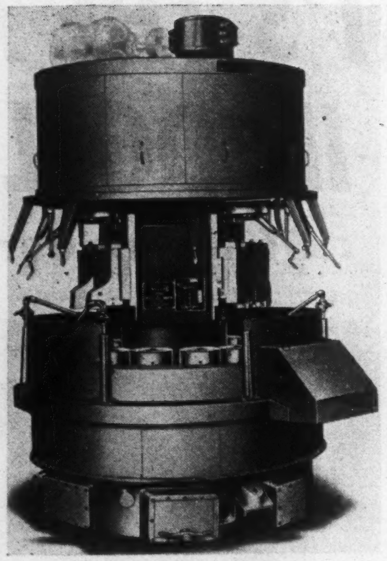
In ADSCO'S large, modern plant with foundry and expert welding equipment, skilled workmen make a wide range of ADSCO Expansion Joints to meet exact code standards. They build them with bronze, semi-steel or steel bodies — for controlling the expansion of low or high pressure steam, hot water, gasoline, oil, air or other pipe lines.

Exclusive features of ADSCO Joints include the internal guide ring to prevent the slip from pulling out of the body — the external, two-piece removable guide — the Piston-Ring joint which can be unpacked and repacked under full operating pressure without interruption to service — the Duplex-Sleeve Joint, etc.

All joints described in ADSCO Catalog No. 35.

ADSCO Piston-Ring Joint

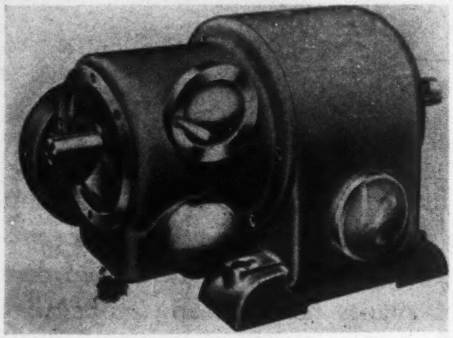
AMERICAN DISTRICT STEAM COMPANY
NORTH TONAWANDA, NEW YORK
Makers of "UP-TO-DATE" Steam Line Equipment For Over 65 Years



of "Mult-Au-Matic" known as the "DF" twin 6 and twin 8 spindle. According to the manufacturer, the design represents a progressive step in chucking machines for the smaller classes of work. Having twin spindles at each of the six or eight stations, this gives a total of 12 or 16 spindles; two are used for chucking, while the balance are machining.

Twin tooling on the head of each station performs identical operations on the work in each of the twin chucks, "which doubles the productive output from one machine at but a slightly greater investment."

Variable Speed Drive



No. 2754**—Covering the entire range of speed control transmission facilities in the power application field — for motor generator drives through to pumps and timing control equipment—the new variable speed drive illustrated is particularly adaptable for medium and higher horsepower applications, according to the manufacturer, Lombard Governor Corp., Ashland, Mass. Its compactness is a particular feature as it is not much larger than the motor with which it is used, and the complete unit with the motor has the size and appearance of two standard a-c motors coupled together.

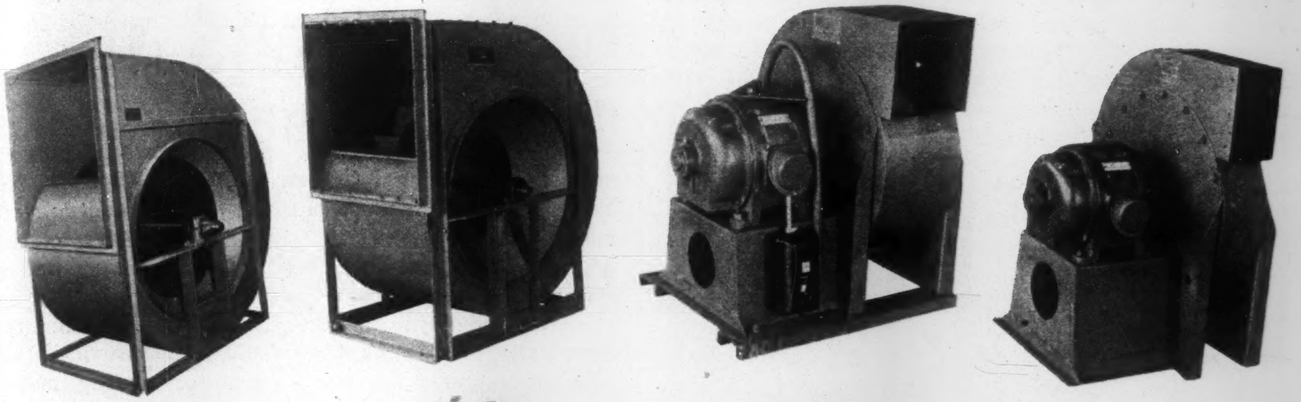
This drive uses the v belt as a control medium only, primary speed reduction being accomplished by conventional gearing methods. Through the gearing arrangement used, 90 per cent of the power goes through the gears while but 10 per cent passes through the v belt.

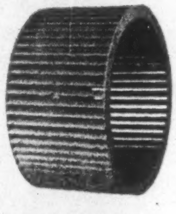
Program Timer

No. 2755—Synchronous motored for accuracy of signals at any 5 min period in a 24 hr schedule—with circuit closure from 5 to 60 sec precisely at the time specified—a new program timer made by Zenith Electric Co., 152 W. Walton Pl., Chicago 10, Ill., is designed for numerous uses in factories, airports, railroads, schools, hotels, and many other institutions.

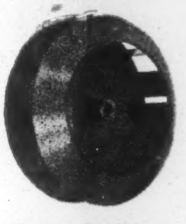
This timer is an automatic switch which can be set to close an electrical circuit at any desired 5 min inter-

ALADDIN SUPPLIES MANY FIELDS WITH AIR HANDLING EQUIPMENT

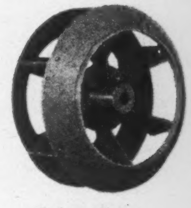




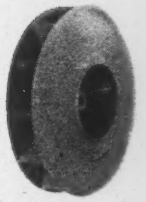
General ventilation, quiet operation



Non-overloading, H.P. characteristic



Exhausting, Conveying

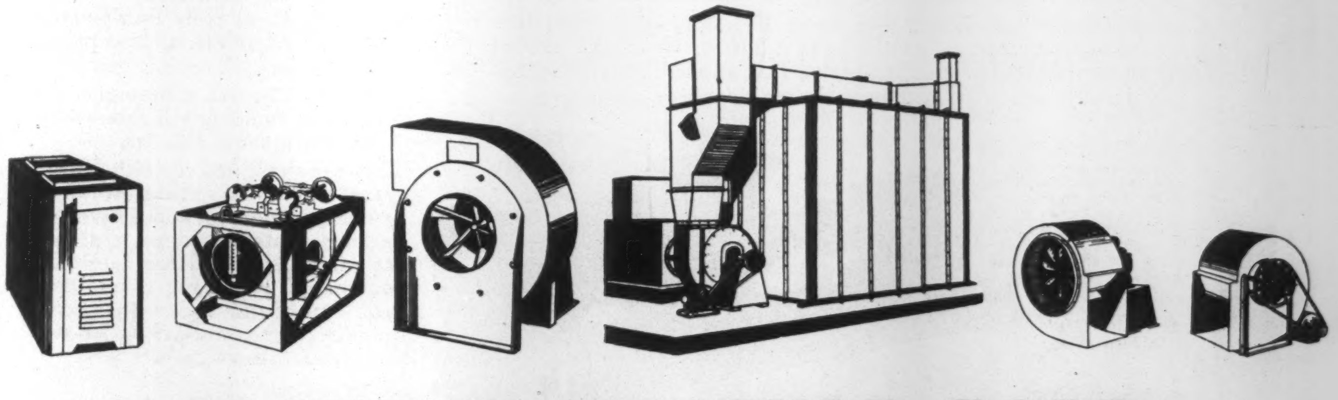


High pressure, low volume

Select the Right Fan!

Aladdin Centrifugal Blowers are manufactured in many standard types, each being offered in a wide range of sizes from which the proper selection can be made. Blowers for special application, non-sparking, non-corrosive and high temperature fans also can be furnished.

We have supplied many thousands of marine-type blowers for shipboard use and a large portion of our manufacturing facilities is now engaged in this work. However, we are still making "impossible deliveries" even on non-standard fans.



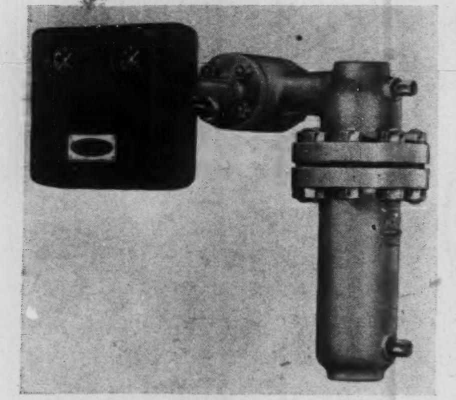
ALADDIN HEATING CORP.

OAKLAND **CALIFORNIA**
2222 SAN PABLO AVE. **TWINOAKS 1022**

val as often as desired. As many as 288 operations a day are possible.

The program mechanism is set automatically by turning the minute hand as on an ordinary clock. The schedule is changed any time without the use of tools. Small spring brass clips are inserted in slots of the program disc for the program desired. These pins select the operating times. Operation is performed by a set of cam-operated contacts. Silver contacts operate with snap action. The rating is 10 amp at 110 volts. The steel case is 8 in. x 12 in. x 4 in.

Liquid Level Controllers



No. 2756—A new displacement type level controller for all level control applications, including interface service, specific gravity control, and remote level indication, was recently announced by the Mason - Neilan Regulator Co., 1190 Adams St., Boston 24, Mass. This device features a new type of control mechanism which eliminates pivot bearings and is said to give extreme sensitivity—0.001 in. change in level will change the output pressure.

A wide range of standard sizes from 14 in. to 15 ft is available to meet a variety of level control requirements. May be had with screwed or flanged top and bottom connections, side cylinder flanged connections, top of vessel flanged connections, or side of vessel flanged connections. The controller case mounting may be righthand or lefthand, and may be reversed in the field without replacement or addition of parts.

Plate Heat Exchangers

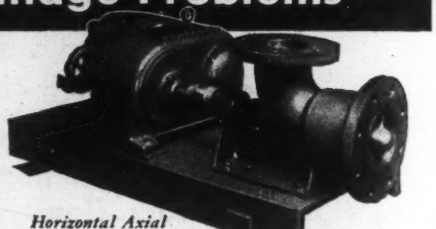
No. 2757—The "Karbate" plate heaters recently announced by National Carbon Co., 30 E. 42nd St., New York 17, N. Y., are particularly recommended by the maker for the heating or cooling of corrosive solutions where a combination of good heat transfer and resistance to mechanical shock is required. Their construction employs unit "Karbate" blocks (this is a chemically inert graphitic material) provided with tubular channels for the heating or cooling medium and extended external surface.

Standard designs are available to meet a wide variety of installation requirements and different types of mountings and connections are provided, "with particular emphasis on strength, flexibility, and ease of installation."

* * * * * *

For your convenience in obtaining more information about any of this equipment, see coupon on page 143. Add the new products and companies listed here to your Directory Section which you received in your January 1944 Heating, Piping & Air Conditioning and thus keep your records of sources of supply up to date throughout the entire year.

LOW COST AXIAL FLOW PUMPS
The Right Answer to Flood and Drainage Problems

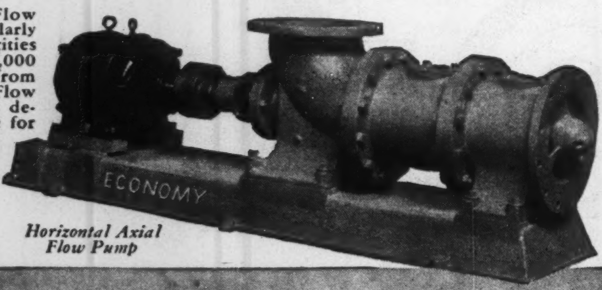


Horizontal Axial Flow Pump with Variable Speed Drive

Industries or municipalities faced with flood dangers will find a solution to their problem in Economy's line of Axial Flow Pumps. Although low in initial cost, these sturdy, dependable, compact units are specially designed to handle tremendous volumes of water. Because their price is much lower than that of centrifugal pumps of equivalent efficiency and mechanical construction, Axial Flow Pumps of very large capacities can be provided for peak flood conditions, without exorbitant expenditure. The pump is of the propeller type, discharging into a guide vane section. Bearings are of heavy duty design, bronze or non-metallic water lubricated internally and ball thrust bearings outboard.

Economy Axial Flow Pumps are particularly adaptable for capacities from 1200 to 50,000 G.P.M. at heads from 5' to 25'. Mixed Flow Pumps of similar design are available for heads up to 45'.

18 in. Vertical Axial Flow Pump



Horizontal Axial Flow Pump

APPLICATIONS

Economy Axial Flow Pumps meet the need of efficient, low priced apparatus for

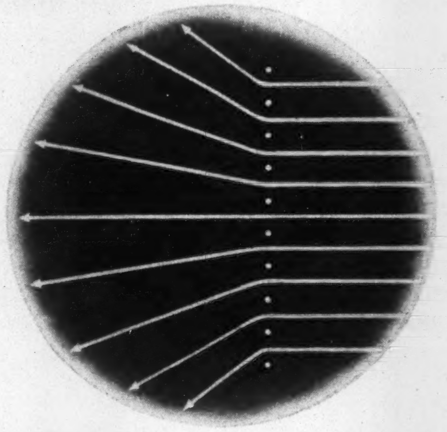
• Flood Control • Drainage and Sewage Pumping • Agitator Service • Irrigation, etc., etc.

They are designed for either horizontal or vertical settings, for drive by electric motors, gasoline or oil engines, water turbines, etc., and are easily arranged for automatic control. If you have a pumping problem—write today for Economy literature, and ask about free Engineering service.

ECONOMY PUMPS, INC.
HAMILTON, OHIO, U. S. A.

Draft-Free Air Distribution

EVEN AT HIGH VELOCITY



. . . because every blade is individually adjustable in

Waterloo AIR DIFFUSERS

You can direct the air flow in any pattern desired, with Waterloo Registers, because EACH blade is INDIVIDUALLY ADJUSTABLE. The throw of air can be lengthened for long rooms, broadened for wide rooms—and shifted both vertically and horizontally. After installation, corrections are quickly and easily made, to suit the individual needs of each room.

Waterloo's exclusive streamlined blades handle high-velocity air with a minimum of sound—even at highest velocities. These are just two of the many advantages available today, and post-war, with Waterloo "registers of the future."

Waterloo REGISTER CO.

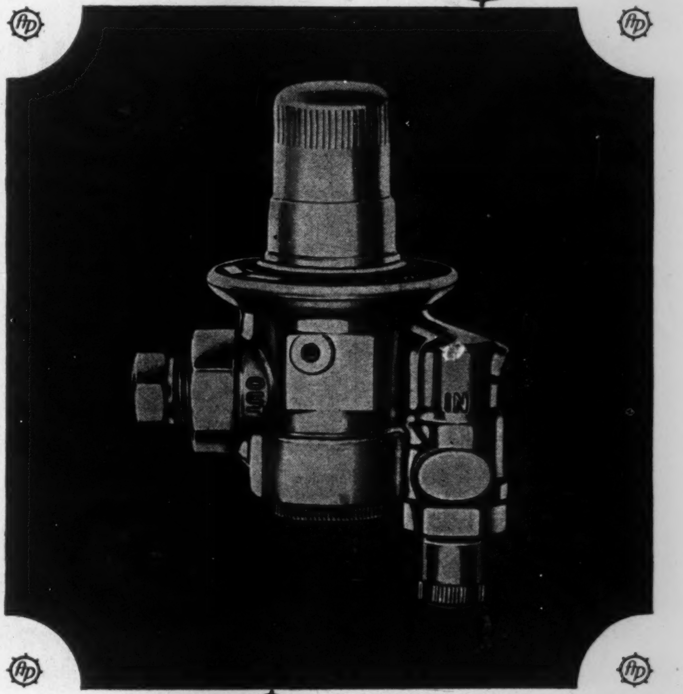
Established 1902

Waterloo, Iowa **Seattle, Wash.**

Representatives in all principal cities

Dependability doesn't happen...

IT'S *BUILT INTO* EVERY AP VALVE



NEW AP MODEL 204 AUTOMATIC EXPANSION VALVE

A new design of a famous and popular A-P Valve, the new A-P Model 204 AUTOMATIC Expansion Valve has many new features for improved operation on domestic refrigerators, beverage coolers, serum cabinets, and similar applications. One of these new features is the moisture-proof metal cap, providing absolutely tight seal against air and moisture for protection against freeze-up in the head, yet offering ready access to the adjusting knob.

Compact, small in size, precision-built throughout, sturdy, sensitive and leakproof, Model 204 has an adjustable range of from 15" vacuum to 35 lbs. pressure. Rated at ¼ ton Freon and ½ ton Methyl Chloride and Sulphur Dioxide, it is designed for long-life, dependable service. For further details, write for Bulletin No. 407A.

AUTOMATIC PRODUCTS COMPANY

2460 North Thirty-Second Street • Milwaukee 10, Wisconsin
Export Dept.—13 E. 40th St., New York 16, N. Y.

DEPENDABLE REFRIGERANT VALVES

Stocked and sold by progressive refrigeration jobbers everywhere . . .
Recommended and installed by leading refrigeration service engineers

Uninterrupted Operation

OF GAS-FIRED EQUIPMENT

...independent of outside current supply

B-60

ALL GAS CONTROLS

During storms or other emergency shut-offs of outside current, B-60 Automatic Control Systems provide uninterrupted gas heating control. No outside electric current is required because B-60 All-Gas Controls are fully self-operating, all necessary current being supplied by a thermocouple pilot generator. No other valve can match this performance.

The B-60 Valve has set a new standard for the safe, automatic control of fuel supply to gas floor furnaces, gas-fired boilers, radiators, ranges, water heaters, and other gas-fired equipment in homes and industry.

Available in sizes 3/8" to 1½" I.P.S. handling natural, manufactured, liquefied petroleum gases. For complete specifications write for Catalog 52B or call nearest General Controls' factory branch or distributor.

AVAILABLE IN PACKAGE SETS

B-60 All-Gas Controls available in Package Sets which provide everything necessary for remote room temperature control: B-60 Control Valve; thermocouple pilot generator; T-80 Series thermostat (with or without thermometer and 13½ hr. timer); 30 ft. wire.

WRITE FOR CATALOG 52B

GENERAL CONTROLS

801 ALLEN AVENUE GLENDALE 1, CALIF.

BRANCHES: Atlanta, Boston, Philadelphia, San Francisco, Denver, Chicago, Kansas City, New York, Cleveland, Detroit, Dallas

Distributors in Principal Cities

See Big Postwar Construction Volume

In spite of the vast sum spent for construction of war plants during the last four years, the volume of new industrial construction after the war is expected to exceed that of the fabulous peak years, 1926-30, Charles E. Young, supervisor of economic research of the Westinghouse Electric & Mfg. Co., said November 28 in an address at the semi-annual meeting of the Producers' Council held in New York City.

"Industrial construction during 1945 probably will total about $735 million, of which about $460 million will be built by private enterprise, and then is expected to average about $845 million during the following five years," Mr. Young said.

"Although the government's investment in war plant construction excluding machinery and equipment has exceeded $7.5 billion, equaling in value all of the privately owned industrial construction from 1922 to 1940, this wartime plant expansion has had little relation to peacetime requirements. Over half of all the total expenditures by the government has gone for the explosives, shipways, and aircraft programs. Almost another third has gone into ordnance other than explosives, and into nonferrous metals and chemicals, which includes synthetic rubber and high octane gasoline.

"Less than one-fifth remains for iron and steel and machinery manufacturing, including the automotive industry. The high degree of concentration in a few industries, and the knowledge that much of this construction was undertaken by the government primarily because it had no foreseeable commercial value, indicates that the government's wartime plant expansion will not even fill all the peacetime requirements of some of these war industries, let alone the great variety of industries for which the war has meant strict curtailment of construction activities.

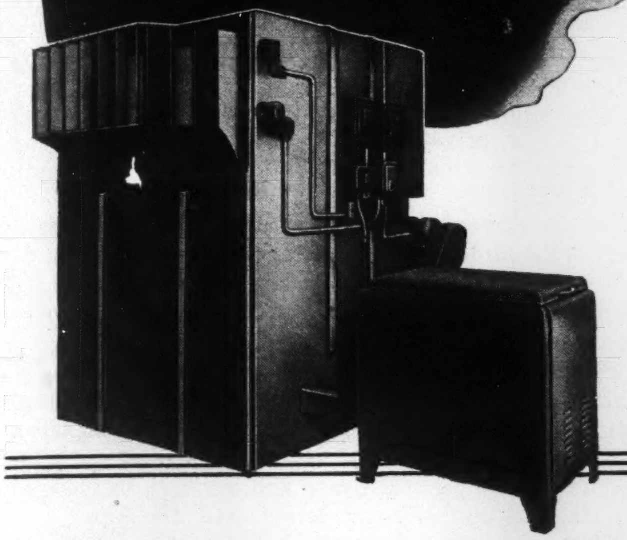
"The need for specialized construction to meet each manufacturer's requirements with maximum efficiency, the uneconomic location of many war plants for commercial use, and the probable delays incident to negotiation for the purchase of war plants are further reasons to suppose that the existence of surplus war plants will by no means preclude an important volume of industrial construction when peace comes.

"Other indications of a large volume of industrial construction after the war are the statements of automobile manufacturers and telephone companies, and the known plans of numerous other manufacturers regarding substantial new plant investment as soon as the removal of restrictions permits.

"Even after allowing for the financial adjustments incident to termination of war contracts and reconverting to peacetime production, the working capital position of industry generally promises to be more satisfactory than in any year of the depression 'thirties' and the supply of funds available for business use will be phenomenal by past peacetime standards.

"Industrial construction will not be held back by lack of financial resources after the war. Add to this the fact that a great many manufacturers will be under pressure, due primarily to higher wage rates, to increase efficiency and reduce costs, and you have a situation calculated to make them cast a dubious eye at the present location and efficiency of their existing plants.

Airtherm Direct-Fired Unit Heaters Give You Warm Air Heat Only Where and When You Want It!



You operate the Directherm Unit only those hours when you need heat—absolutely no waste of fuel due to stand-by loss. There is no danger of freeze-up when the unit is turned off over night.

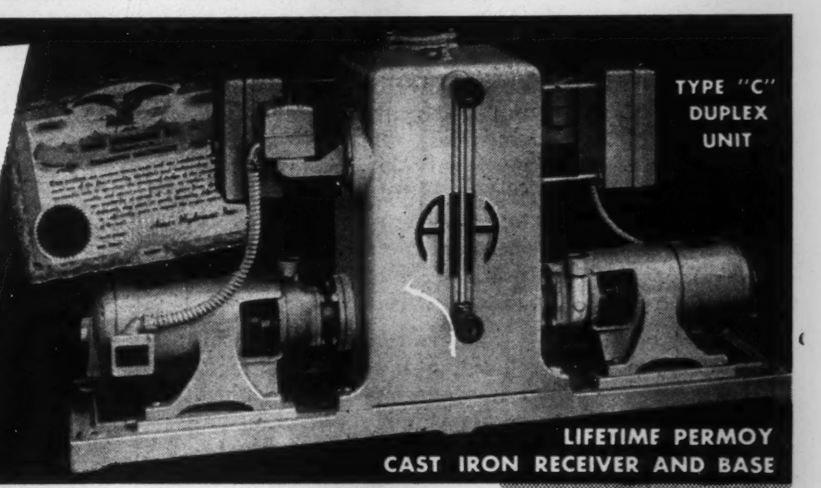
The Directherm Heater has a minimum number of parts, high efficiency on the combustion chamber, comparatively low outlet temperature, and a horizontal high velocity air stream with adjustable wide angle of warm air delivery. Can be adjusted to give you heat only where you want it, when you want it.

The Directherm Heater is scientifically built in 6 standard sizes with capacities from 300,000 to 1,500,000 BTU's.

Write today for bulletin giving complete details and specifications on this versatile, efficient heating unit.

AIRTHERM
MANUFACTURING CO.
711 S. Spring Avenue St. Louis 10, Missouri

AMES
HYDROVAC
CONDENSATE RETURN UNITS



TYPE "C" DUPLEX UNIT

LIFETIME PERMOY CAST IRON RECEIVER AND BASE

SUPERIORITY GUARANTEED!
Engineering skill of the highest order combined with metals and other materials of topnotch quality account for the unusual 3-year Wear-Proof guarantee that goes with HYDROVAC UNITS. Note, too, these special features.

- MOTOR VENTILATION Pat. Applied for
- SPECIAL MOISTURE-RESISTING VARNISH ON WINDINGS
- EXTRA LARGE SHIELDED BEARINGS
- LARGE PACKING SPACE
- HYDRAULIC BALANCE REDUCES THRUST
- NEOPRENE WATER SLINGER

Superior in Every Way
(1) High Efficiency. (2) Beauty of Design. (3) Lifelong Durability. (4) Negligible Maintenance Cost.
Write for Bulletin No. 200-A showing Consultants' Specification Form, Standard Ratings and Blueprint
Also ask for Bulletin No. 100-A on complete line of HYDROVAC VACUUM RETURN UNITS

PUMPS BY WORTHINGTON

AMES
HYDROVAC
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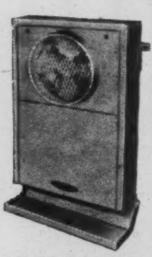
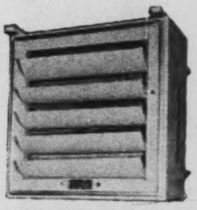
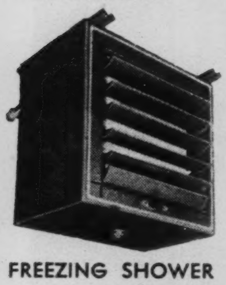
290 SCHOLES STREET
BROOKLYN 6, N. Y.

KRAMER
Heat Transfer
PRODUCTS


PANEL UNITS


COOLMASTER


FREEZING SHOWER

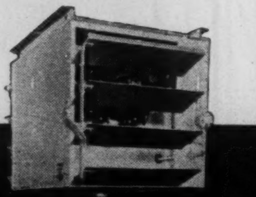
WE are standing at the crossroads of post-war reconversion looking forward to the great industrial markets that lie ahead, when refrigeration will play a still more important part in our nation's progress.

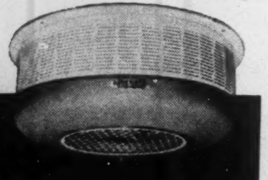
New creative ideas, resulting in improved methods and machines, stimulated by the needs of war, will be presented, and the Kramer Trenton Company is prepared to meet the demands with dependable, modern Heat Transfer Products.

Men and management, including our well staffed, modernly equipped laboratory, combine their skill and inventive ability to the advancement of commercial refrigeration now and in the years to come.

Write for Catalog R-142.

FREEZING OVEN


RADIAL UNIT COOLER


KRAMER TRENTON CO.
TRENTON. 5. N. J.

"As for the cost of industrial construction after the war, a 30 per cent rise since 1940 already is behind us. I see no reason to suspect that there will be any drastic decline in the prices of either building materials or building labor over the next few years. Nothing has been added to the estimates of future industrial construction volume to allow for further increases in cost beyond the present level," he concluded.

The volume of new construction during 1945 probably will be about $4.8 billion or 26 per cent greater than in 1944, provided the war with Germany ends early in 1945 or before, according to a forecast prepared by the market analysis committee of the Producers' Council and made public at the meeting. The estimate is subject to revision if the war in Europe lasts until the summer of 1945, Wilson Wright, committee chairman, explained.

"The committee's estimate places the probable volume of new private construction at $2.8 billion and public construction at $2.0 billion for the 12 month period," he said.

"In arriving at these estimates, it has been assumed that WPB order L-41 limiting construction will be either revoked or greatly relaxed shortly after the termination of active warfare in Europe," according to the report.

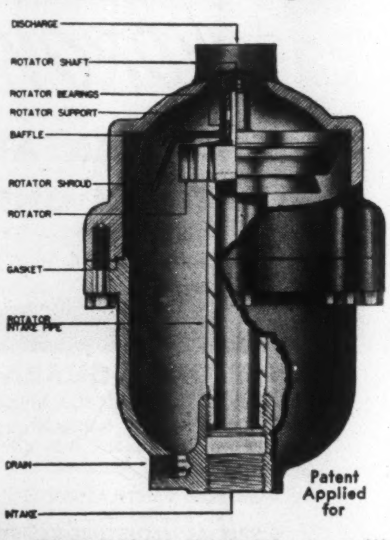
The construction industry was urged by Douglas Whitlock, president of the council, to form a unified national organization for the purpose of developing a program to insure a maximum volume of building throughout the postwar years and devising methods of reducing the cost of construction after the war.

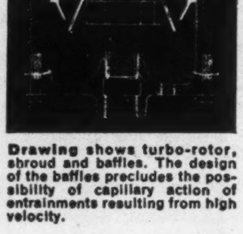
Whitlock's proposal, made in an address before a joint luncheon held by the New York Building Congress

NEW TURBO-ROTOR *Pur-O-fier*

For Compressed Air

This new unit effectively eliminates moisture, oil and scale from compressed air lines. Pur-O-fier utilizes the principle of centrifugal force to separate entrainments from purified air. Once installed it requires absolutely no maintenance. Penstar Tru-Bond oiless bearing guarantees long, trouble-free operation. Manual or automatic drains provided.




Drawing shows turbo-rotor, shroud and baffles. The design of the baffles precludes the possibility of capillary action of entrainments resulting from high velocity.

THREE MODELS AVAILABLE—A-1 will accommodate volumes from ½ to 5 cu. ft. A-2, volumes from 10 to 35 cu. ft. A-4, volumes from 35 to 100 cu. ft. Multiple units are recommended for volumes above this range. Pur-O-fier is the only standard unit that can be engineered to meet any air volume for regular or intermittent service.

BIRD-WHITE COMPANY
3120 West Lake Street, Chicago, Illinois
Dept. H.P.

and the council, called for the organization of a national construction industry council to be composed of representatives of all factors in construction. He proposed that the new organization be established under the roof of the Chamber of Commerce of the U. S.

"In the economy of virtually full employment which all of us are aiming for after the war, construction is counted on to provide about one-seventh of all employment and one-twelfth of the entire national output," Mr. Whitlock said. "There is nothing impossible in that picture, but it won't come about automatically. All of the best thinking in this huge construction industry must be collected and coordinated and presented convincingly to the government and to the public."

Establishment of "a climate favorable to rapid expansion of construction after the war is the greatest need today," rather than an effort to increase the demand for new homes and other construction, James W. Follin, managing director of the Producers' Council, said in an address.

Hydrofluoric Acid Facilities Authorized

The WPB has authorized construction of new facilities to alleviate a serious shortage of anhydrous hydrofluoric acid, the Hydrofluoric Acid Producers Industry Advisory Committee was informed at a recent meeting. Anhydrous hydrofluoric acid is used in the manufacture of aviation gasoline and the production of "Freon-12" for refrigeration and aerosol bombs, as well as for military applications. Because of plant breakdowns and other production complications, the output of anhydrous hydrofluoric acid has not met production goals.

WHEN YOU INSTALL UNIT HEATERS..BE SURE THEY ARE TROUBLE AND MAINTENANCE FREE!
INSTALL GRID
here's why
HIGH TEST CAST IRON HEATING SECTIONS
GRID

IT'S the material that makes the difference in GRID Unit Heaters. They are built to last because: One piece construction heating sections (patented) of high test cast iron that withstand steam pressures up to 250 lbs. . . . no soldered, brazed, welded or expanded connections to become loose or develop leaks . . . no electrolysis to cause corrosion, breakdowns, leaks, or heating failures. Complete information and capacity tables upon request.

BLAST SECTIONS

The same high efficiency and lasting qualities as GRID Unit Heaters . . . one piece construction of "fin" sections of high test cast iron . . . no tortuous air passages . . . complete absence of ruptures, strains, and warping. Guaranteed for steam pressures up to 250 lbs. Complete information upon request.

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NEW BOOKS & REPORTS

Air Conservation

A 111 page, 8½ x 11 in. book, entitled Air Conservation Engineering, was recently published by W. B. Connor Engineering Corp., 114 E. 32nd St., New York 16, N. Y. Edited by G. S. Dauphinee, F. H. Munkelt, and H. Sleik, it contains sections on the value of air, basic factors, air recovery procedure, activated carbon and its application, savings through air conservation, application of air recovery equipment, control of concentrations by air recovery, sorption, "Dorex" air recovery equipment, canister selection, typical applications of such equipment, and examples of installations. There is also a technical reference data section, an equipment catalog section, and a partial list of installations.

Thus, the aim of the book is to outline air conservation in theory and practice, discuss conditions as they are met and overcome, and to present the data, tables, and charts needed not only by the engineer in considering the use of air conservation, but in studying its application to air conditioning. Air conservation engineering is defined as "concerned with recovering used air in the interest and efficiency of economy in air conditioning."

Complimentary copies of this book are available to "recognized engineers" upon written request to its publisher. The price of the book is $2.

Smoke Prevention

The proceedings of the 38th annual meeting of the Smoke Prevention Association of America, Inc., may now be obtained from the SPA headquarters, 139 N. Clark St., Chicago, Ill., for $2. It is a 150 page, 8½x11 in. volume, including the many interesting papers read and presented at the meeting held June 6 to 9 in Detroit. Among the subjects included are smoke prevention and fuel conservation, smoke abatement in city planning, influence on postwar smoke abatement work of the bituminous coal research program, service training of operating personnel, spreader stoker firing, smoke prevention from the stoker manufacturer's standpoint, fly ash collection and advantages of fly ash recovery, overfire air and steam-air jets, and railroad smoke abatement.

A special section is devoted to the aims and progress of the National Fuel Efficiency Program, why and how coal must be conserved, and the coal industry's contribution to fuel economy. There is also a paper on weather and air pollution, a discussion of meteorological factors affecting smoke pollution, and a resumé of the history of atmospheric solids collection in Detroit.

Foreign Welding Terms

The American Welding Society, 33 W. 39th St., New York 18, N. Y., has published a 16 page booklet of German-English, French-English, Russian-English, and Spanish-English welding terms, many of which have been derived from foreign technical literature and are not found in any standard or technical dictionary. The price of this booklet is 50c.

AEROQUIP ANNOUNCES:
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3 PIECES (EACH REPLACEABLE)
ASSEMBLY WITHOUT SPECIAL TOOLS.
FITTINGS CAN BE REMOVED FROM
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IN STANDARD LENGTH 24,
36 OR LONGER

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RECENT TRADE LITERATURE

For your convenience in obtaining copies of these bulletins, see coupon on page 143. If you write direct to the manufacturer, describe carefully what literature you want, as the number given first in each item is for use only when sending in your request to Heating, Piping & Air Conditioning.

Acetylene Generators

No. 4836—4 p. bulletin (ADC 619-A) on "Airco" acetylene generators featuring a new portable type incorporating an air lift water circulating system and enlarged radiation space between carbide hopper and water level to eliminate "hot belt" and provide cooler, double-scrubbed gas. Portable models in 30, 60, and 100 cfh productive capacity, and stationary models which deliver 300, 600, and 1000 cfh, are covered.—Air Reduction Sales Co., 60 E. 42nd St., New York 17, N. Y.

Air Exhausters

No. 4837—2 p. data sheet describing "Agitair" wind actuated or fan equipped exhausters, giving dimensions, information on selection, and summarizing advantages. —Air Devices, Inc., 17 E. 42nd St., New York 17, N. Y.

Air Filters

No. 4838—16 p. bulletin (AF 44-1) on "Agitair" permanent, cleanable air filters, with technical data, specifications, dimensions, information on holding frames, data on grease filters, etc.—Air Devices, Inc., 17 E. 42nd St., New York 17, N. Y.

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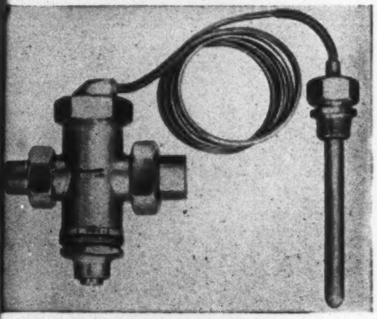

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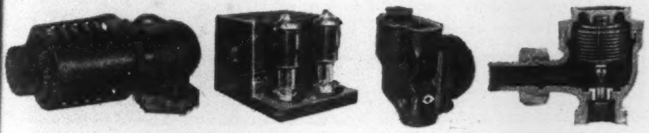
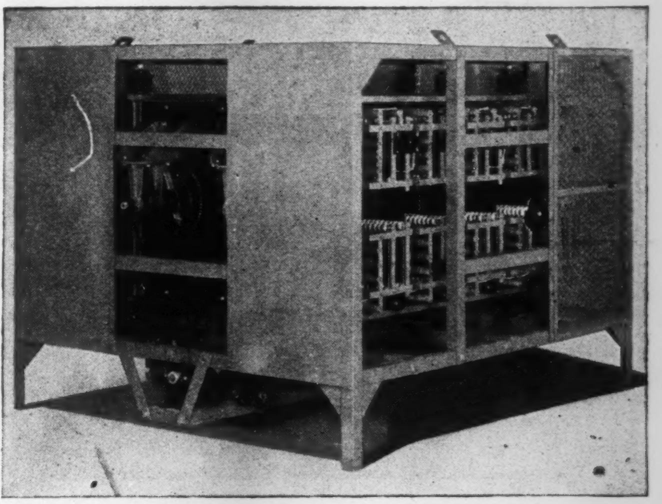
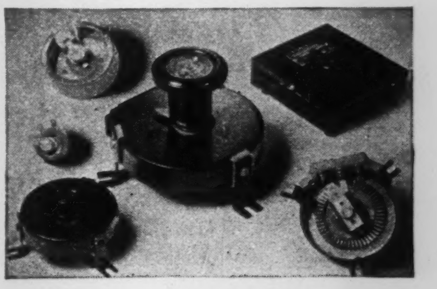




ASSEMBLED RHEOSTATS

Here is a Ward Leonard assembled rheostat designed for production testing of grid-controlled rectifier tubes. It consists of five face plates with each face plate composed of two rheostats. Each rheostat will drop from 0 to 375 volts at any current between 15 and 0.15 amperes. The rheostats are mechancially connected but electrically independent. They may be connected in series to give a maximum drop of 3750 volts or in parallel to give a maximum current of 150 amperes. The assembly is tested at 10,000 volts to ground and 2,000 volts between rheostats. Whenever you have an electric control problem, Ward Leonard engineers are at your service.



The Ward Leonard line of rheostats includes steel plate types, porcelain ring types and ribohm face plate types. These rheostats provide control for the minute current requirements of the laboratory and the haviest current demands in industrial applications.

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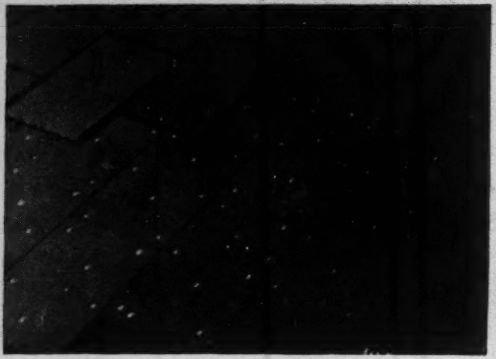

Floor of J-M Rock Cork. This insulation is strong enough to support normal floor loads including ice-making tanks.

The actual rate of conductivity of Johns-Manville Rock Cork is less than 0.33 Btu per sq. ft. per deg. F. temperature difference per in. thick, per hour at mean temperature below 100° F. And Rock Cork retains lasting insulating efficiency through years of service. Being basically mineral, this insulation is

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Also, J-M Rock Cork has these additional outstanding features which make it the ideal low-temperature insulating material:

Can't rot • Does not embrittle
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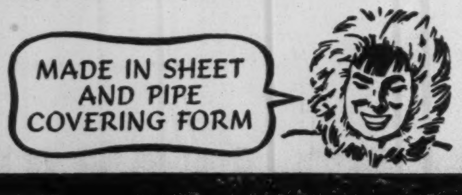
Easy to saw and apply
Shrinks less than steel

Get the full facts on Rock Cork and its possibilities for your insulating needs. Write for brochure, DS-555. Johns-Manville, 22 E. 40th St., New York 16, N. Y.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ROCK CORK

Air Filters

No. 4839—4 p. bulletin (F-164) on "Far-Air" air filters, describing and illustrating a unit in designs for all industries, including marine, railroad, aviation, small engine, diesel engine assembly, round, and automatic cleaning types. Performance data are included.—Farr Co., 2615 Southwest Dr., Los Angeles 43, Calif.

Cleaning and Treating Heating Systems

No. 4840—12 p. sales and service manual on "A&T" colloid for cleaning and treating steam and hot water heating systems, discussing the importance of internal cleanliness of boilers, submerged tank or tankless coils, and discussing conservation of fuel, conservation of metal, and peak performance of heating systems. The effect of scale on heating surface is illustrated and complete instructions for use of the method are given.—Agnew & Tomlinson, New York 17, N. Y.

Dip Tanks

No. 4841—16 p. catalog on insulated hot dip tanks electrically heated with thermostatic controls. Also 16 p. catalog containing complete specifications for insulated hot dip tanks fueled by city gas or natural gas.—Aeroil Burner Co., Inc., Park Ave. at 57th St., West New York, N. J.

Direct Fired Warm Air Heating

No. 4842—20 p. portfolio (512) describing the direct fired warm air method of heating, and illustrating a number of war structures using this method, including a 35 acre bomber modification center, ordnance depots,

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For Vertical Shell and Tube Ammonia Condensers

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tank arsenals, naval warehouses, and corrugated sheet steel huts used by the armed forces at advance bases. According to the manufacturer, this heating method is "particularly adaptable to the aeronautical, industrial, and automotive fields in peacetime."—Dravo Corp., Machinery Division, 300 Penn Ave., Pittsburgh 22, Pa.

Fan Research Laboratory

No. 4843—8 p. brochure, almost entirely pictorial, featuring a recently completed research laboratory and containing fascinating workshop scenes showing the many testing and research processes continually taking place in this building "devoted to the scientific study of air."—Ilg Electric Ventilating Co., 2850 N. Crawford Ave., Chicago 41, Ill.

Flexible Metal Hose

No. 4844—Small 12 p. pamphlet on flexible metal hose for industrial uses, showing the basic types of such hose available and giving some of their specifications.—Chicago Metal Hose Corp., 1315 S. Third Ave., Maywood, Ill.

Heating, Cooling, Air Handling, and Air Conditioning Equipment

No. 4845—84 p. catalog (PB 290) issued "to permit the selection now of heating, cooling, air handling, and air conditioning equipment for civilian construction projects that will get under way when the war is over," with information on the manufacturer's products that will be available when restrictions on civilian construction have been removed. The products are carefully

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No. 7

And Keep It Out With

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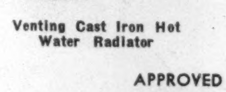
Don't fight air pockets or traps in hot or cold circulating lines! "Get that air out of there" *and keep it out* simply by installing the No. 7 Maid-O'-Mist Automatic Air Vent. This reliable air vent has a self-closing float-controlled valve and is designed especially for circulating pipe lines, convector radiators, unit heaters, cooling manifolds, tanks, diesel engines, or any other application where air pockets or traps retard the free circulation of liquids. For pressures up to 75 lbs. Now available in bright brass finish.



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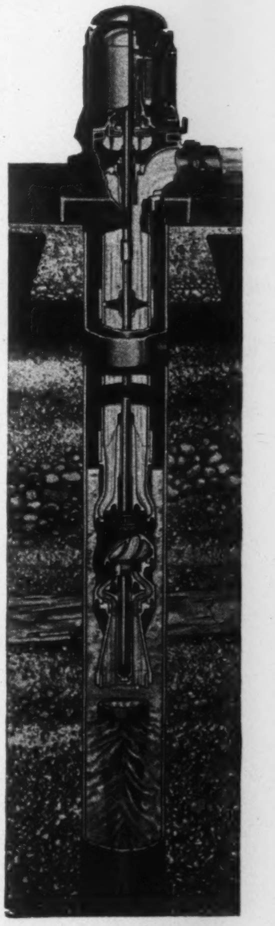

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The Peerless Pump Distribution Organization, a member of which will be found in your near neighborhood, is composed of the most efficient and dependable pump men in the country today. Cooperating with our own factory-trained field engineers, they stand ready to offer you of their wide experience and skill.

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Research Air Filters have proven their efficiency in industrial dust removal, central air conditioning, ventilating systems, railroads, forced warm air furnaces, unit air conditioners, paint spray booths, and air intakes on diesels and air compressors.

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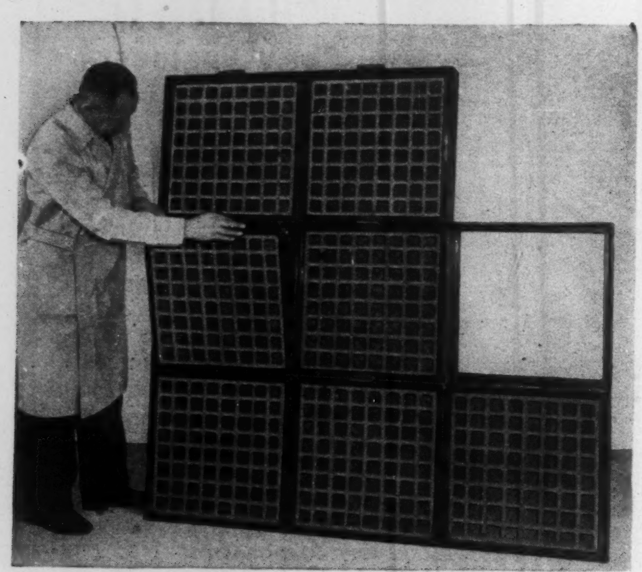

Behind every foot of frontal area in the Research Air Filter are over 25 square feet of deposit surface which give a high dust holding capacity.

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Madison 3, Wisconsin

illustrated and sufficient data on capacities, roughing-in dimensions, etc., are given "to make possible the satisfactory selection of all equipment illustrated." Many new products are shown and include such items as an induced draft cooling tower, a new and revised refrigeration line, new convector models, and improved hot water products.—Trane Co., La Crosse, Wis.

Instruments and Controls

No. 4846—28 p. issue of Modern Precision, Vol. 4, No. 1 (Folder ENT 7a) briefly describing all of the manufacturer's products for regulating plant processes. One section describes the instruments for measuring by each of the manufacturer's four pyrometric methods, and another section is devoted to a discussion of heat treating furnaces, with a page describing and illustrating each method.—Leeds & Northrup Co., 4970 Stenton Ave., Philadelphia 44, Pa.

Insulating Cement

No. 4847—8 p. booklet on high temperature insulating cement giving composition, characteristics, uses, specific applications, procedure for applying, coverage, data on thermal conductivity, and test results on various mixes. Heat losses and outside temperatures for various thicknesses are charted, and tables show results of applying the cement to both insulating refractory brick walls and firebrick walls. There is also pertinent information of a general nature.—Universal Zonolite Insulation Co., 135 S. La Salle St., Chicago 3, Ill.

Insulating Underground Piping

No. 4848—4 p. folder on "b-t-u" insulation for under-

EFFICIENT
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De Luxe type WK Pressure Actuated Water Regulating Valves for Freon, Sulphur or Methyl, are pilot operated, modulating. Standard adjustable opening range from 50 to 150 lbs. Factory set to open at 90 pounds. Precision engineering and individual testing for low cost, satisfactory performance. Available in sizes of ¾ to 2 inches FPT. Simple adjustment—easily serviced.

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ground piping, describing the method and giving its composition and data on installation. Seven basic features are summarized and sectional details and installation photographs are shown.—Universal Zonolite Insulation Co., 135 S. La Salle St., Chicago 3, Ill.

Low Temperature Brazing

No. 4849—4 p. issue of Low Temperature Brazing News (No. 29), pointing out how the preplacement of "Sil-Fos" and "Easy-Flo" can "save time and money by simplifying and speeding up brazing operations."—Handy & Harman, 82 Fulton St., New York 7, N. Y.

Mechanical Meters

No. 4850—8 p. bulletin (3010-31) on tilting U tube mechanical type meters incorporating the following three features: (1) flow measurement by response to difference in pressure by a mercury seal in a U tube, (2) weighing mass by means of a beam balance, and (3) the use of torsion tubes as "the solution of the stuffing box problem."—Cochrane Corp., 3131 N. 17th St., Philadelphia 32, Pa.

Ozone Equipment

No. 4851—8 p. bulletin on "Ultra-Violet Ozo-Ray" equipment for air purification which is said "to duplicate the sun's purifying action in destroying odors, smoke, and gases." The equipment itself is illustrated and described and various installations are shown.—A & J Co., 844 W. 59th St., Chicago 21, Ill.

Plastic Surfacing

No. 4852—44 p. booklet discussing 20 years of plastic

HOW DIRTY ARE YOUR FILTERS?
THIS GAGE TELLS
0-1 .2 .3 .4 .5
HAYS

HAYS AIR-FILTER GAGE

- *Automatic*
- EASY TO INSTALL
- SAVES MONEY
- ELECTRICALLY OPERATED

If you are confronted with the problem of not knowing when the collected dirt in your filters is of sufficient density to decrease operating efficiency, install a HAYS Air-Filter Gage. The HAYS indicator shows amount of air resistance at all times—tells when to renew filter element—eliminates guess work—can be made to sound alarm when resistance is excessive. Write for full information. Ask for HAYS Bulletin A-F G.

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WHICH FUEL?
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WHAT ABOUT TOMORROW'S MIRACLE HOME HEATING?

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For some time, we have been bombarded with questions about the new ideas in home heating.

To help clear up this obvious confusion we have prepared a booklet. It explains in simple words that a home owner can understand (1) what true heating comfort means (2) the advantages and limitations of each type of system (3) automatic heating with various fuels (4) other pertinent and commonly questioned points about "indoor climate."

We believe you will want to read this booklet. Perhaps it may save you time in answering similar questions . . . Write for your copy and after looking it over if you have any suggestions for the next edition send them along.

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surfacing and intended to suggest a more extensive field of usefulness for plastics than is generally recognized. According to the manufacturer, the success of chemical engineers "in endowing thin films, deposited on the surface by convenient methods, with the inherent strengths of the basic plastics has contributed to better product performance in many fields."—Roxalin Flexible Finishes, Inc., 800 Magnolia Ave., Elizabeth F, N. J.

Salvaging Iron Castings

No. 4853—12 p. booklet describing four ways to salvage, reclaim, and conserve iron castings by electric arc welding, with pertinent facts and engineering data for foundries and machine shops on the use of electrodes for welding cast iron.—C. E. Phillips & Co., 2750 Poplar St., Detroit 8, Mich.

Steel Production for War

No. 4854—96 p. booklet entitled Republic Goes to War, giving the "service record" of the manufacturer in World War II, describing some of the large projects the company undertook at the request of various government agencies, the changes in production, the increases in output, and the many other ways in which the war effort has been served.—Republic Steel Corp., Republic Bldg., Cleveland, Ohio.

Valves and Forged Steel Fittings

No. 4855—8 p. bulletin (130-A) on hydraulic equipment, valves, and forged steel fittings for the process industries, with information on hydraulic presses, hydraulic pumps, hydraulic and pneumatic accumulators, intensifiers, hydraulic gages, etc.—Watson-Stillman Co., 140 Aldene Rd., Roselle, N. J.

Welding

No. 4856—12 p. issue of Sparks (Vol. 3, No. 4) devoted to the food processing industries, stressing the importance of piping as a key piece in modern food processing. The use of welding fittings in simplifying food plant piping is featured.—Tube Turns, 228 E. Broadway, Louisville 1, Ky.

Welding Electrodes

No. 4857—16 p. bulletin (L6348) on arc welding electrodes, giving a complete description of each electrode in the manufacturer's line and with charts on physical properties of weld metal. There is also a chart of recommended current values.—Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.

Welding Electrodes

No. 4858—Booklet on "Page-Allegheny" stainless steel welding electrodes suggesting how to select the proper one, and with helpful information on procedures and recommendations. The first section is devoted to a discussion of the conditions encountered in welding stainless steel, and the second section gives detailed information on the various types of electrodes.—Page Steel and Wire, Div. of American Chain & Cable Co., Inc., Monessen, Pa.

INCREASED REFRIGERATION CAPACITY

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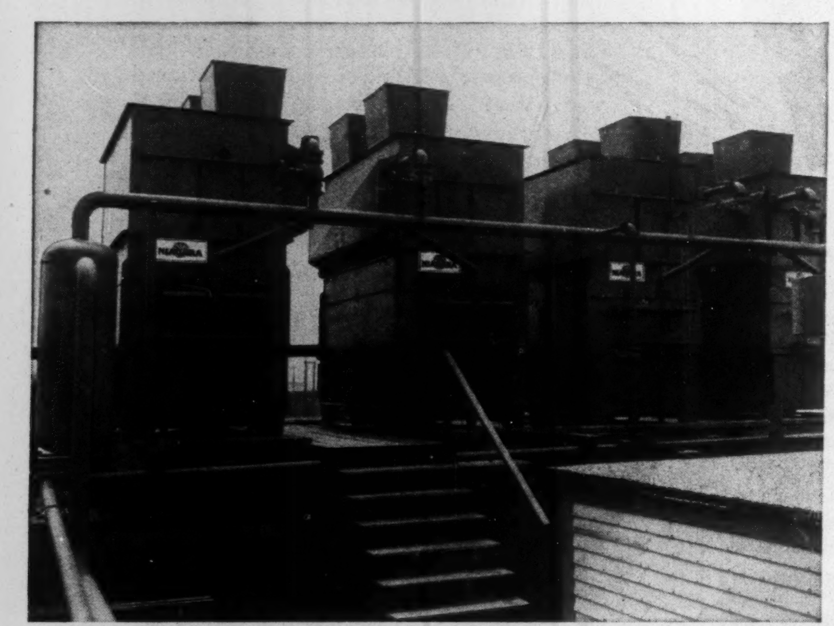

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Large users of refrigeration have reduced operating costs by thousands of dollars thru power savings, thru savings of condenser water and by obtaining extra capacity.

These savings are made by the NIAGARA DUO PASS *AERO* CONDENSER using outdoor air as the cooling and condensing medium for refrigerant gases, reducing compressor head pressure.

Only the patented NIAGARA DUO PASS assures these gains because no other evaporative condenser lowers condensing temperatures to the point where deposits do not accumulate on outside of condenser tubes. This eliminates shut-downs for cleaning and assures full condensing capacity at all times. Write for Bulletins 91 and 93. Address Department HP-124.

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HUMIDIFYING • AIR ENGINEERING *EQUIPMENT*

• WPB . . . OPA . . . PAW . . . Etc. •

Aircraft Plumbing Fittings

WPB announced November 25 revocation of order L-313, a standardization order governing the manufacture of aircraft plumbing fittings.

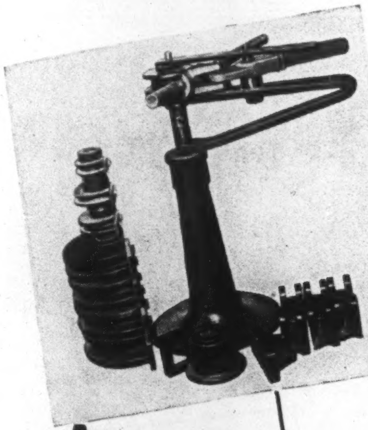
Coal

With the heating season already under way, the nation faces heavy winter requirements with bituminous coal stocks millions of tons lower than those of either of the two preceding war years, Solid Fuels Administrator for War Harold L. Ickes announced November 6.

Stocks of bituminous coal in consumers' hands on October 1, on which reports were available, totaled only 64,905,000 tons, in comparison with 72,866,000 tons on the same date in 1943 and with 87,311,000 tons on October 1, 1942.

Soft coal stocks on October 1 were about 996,000 tons above revised estimates for September 1. However, the average of 43 days' supply on hand in terms of consumption during the month remained the same as that of September 1, reflecting the seasonal rise in coal use.

Increasing consumption, coupled with production limitations imposed by manpower shortages, is likely progressively to cut into these stocks as the winter advances, Administrator Ickes said. Substantial with-



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A Few Of Our More Than 12,000 Customers: Bureau of Ships, Wash., D. C.; Henry J. Kaiser Co., Calif.; Pacific Bridge Co.; Bethlehem-Hingham Shipyards; Hercules Powder Co.; Stone & Webster; E. I. Du Pont de Nemours & Co.; Crane Co.

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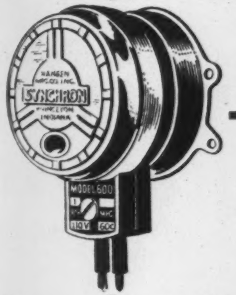

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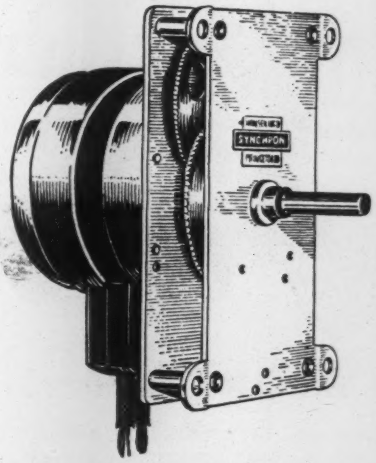

*The tiny SYNCHRON Motor gives power and stamina to SYNCHRON Timing Machines. Self-starting, synchronous, self-lubricating, quiet, long-wearing. Operates at standard intervals of 1 RPM, 1 RPH, 1 RP12H, and 1 RPD. Other intervals if desired.

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drawals will put many consumers, with low stocks now below the danger point of coal protection. It is obviously imperative that all consumers must conserve coal, he said.

Anthracite production is expected to fall about 6 million tons short of the amount of solid fuels necessary to meet full space heating requirements in the New England and Mid-Atlantic states, Deputy Solid Fuels Administrator C. J. Potter told the New Jersey Retail Fuel Merchants Association last month. This is based on requirements of some 47 million tons of domestic anthracite against estimated production of 41 million tons.

Construction Limitations

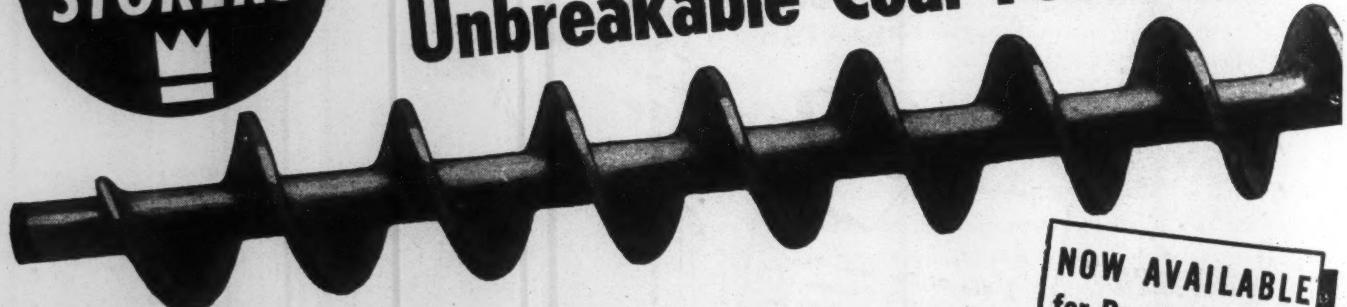
Modifications in the construction limitations applicable to certain authorized building projects, which reflect recent changes in WPB orders governing materials used in construction, have been made in schedule A to controlled materials plan regulation No. 6, WPB reported October 31.

The revised restrictions are applicable to all construction authorized on form GA-1456 whenever issued. A builder who has received such an authorization may follow either the new or the old restrictions. The changes also apply to certain utility construction controlled by WPB order U-1 (utilities). They do not, however, apply to housing construction authorized by the National Housing Agency. Such housing is subject to limited preference rating order P-55-c, and not to Schedule A of CMP regulation 6, WPB pointed out.

Form GA-1456 is used to authorize most commercial,

For STOKERS

The CROWN Unbreakable Coal Feed Screw



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industrial, and agricultural construction controlled by conservation order L-41, the basic construction order. Other forms are used for housing construction approved by NHA, for certain Army and Navy construction, and for a few other specialized kinds of construction.

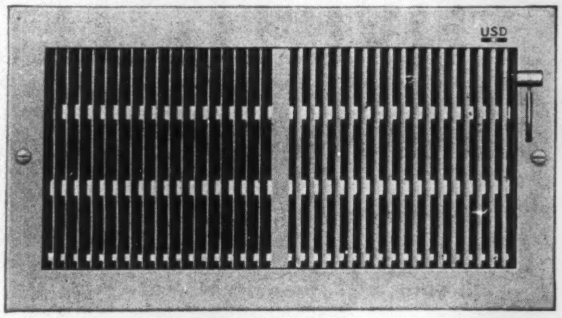
The amended schedule permits builders to use the following materials or products formerly prohibited or restricted: Steel plate, aluminum, metal lath, certain building components such as hardware, plumbing and heating items, and certain other items manufactured from steel sheet or strip, or from copper.

The requirement that structural steel and reinforced concrete buildings be designed in accordance with WPB directives 8 and 9 has been eliminated to conform with the revocation of these directives on October 4, 1944.

Restrictions on the use of lumber for building construction have been simplified. The requirement that builders obtain permitted lumber from local wood lots or by the resawing of larger, less critical sizes, has been eliminated. Former restrictions on electrical installations have been changed to a single prohibition against installation of wire and conduit of larger sizes than the minimum required by the 1940 national electric code.

Copper Products and Alloy Tubing

Production of copper products and alloy tubing reached an alltime high in October, it was disclosed at a meeting last month of the Brass Mill Industry Advisory Committee, the WPB reports. Brass mills in October produced 35,000,000 lb of copper products and 30,000,000 lb of alloy tubing, both record figures. On



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INSTALL THE
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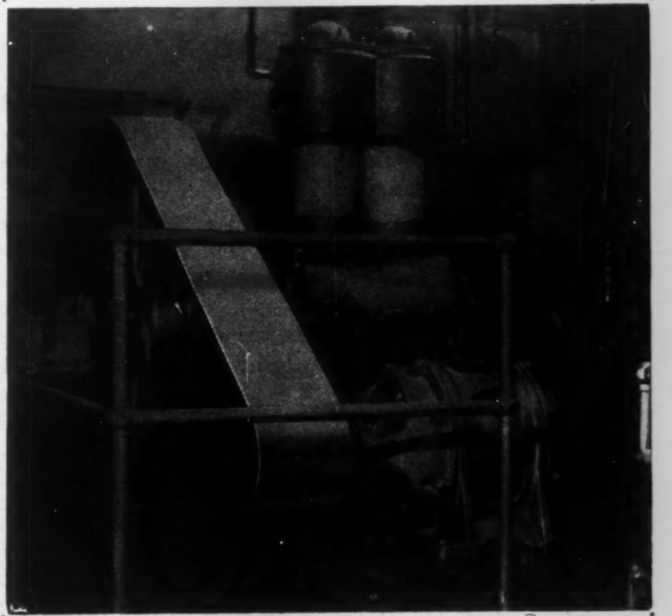

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These drives which consist of Rockwood pivoted motor bases with Tannate Leather Belts have proved their extreme dependability on a great many air-conditioning installations. The weight of the motor on the pivoted Rockwood base automatically adjusts the belt tensions thereby assuring high efficiencies even when the load fluctuates. The tight pulley grip of Tannate assures smooth running and a steady pull. These features of the Tannate-Rockwood drive add up to real power transmission economy. Write us for full details.

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the other hand, the October output of 91,000,000 lb of rods was described by WPB officials as "very good." Strip production, however, was "slightly off" with the output measuring 233,000,000 lb. This was attributed to a downward adjustment of some ammunition programs.

Copper Tubing

Distributors of all petroleum equipment except that for refining industry may obtain copper tubing to sell to repairmen for use in repairing this equipment under terms of CMP regulation 9A as amended November 17, WPB said.

Copper Base Alloy

Prewar serviceability will be restored to a number of highly important civilian products and components through a supplemental fourth-quarter allotment of 16,030,000 lb of copper base alloy, the WPB announced November 14 through its Office of Civilian Requirements. The WPB warned that many products using the copper will not come onto the market for some time, since manufacturers will have to order the copper and arrange to process it. Among the products that have suffered in varying degrees through the substitution of less suitable materials for copper and brass and that will be restored to normal or nearly normal composition —except for plating—are a wide line of plumbing and heating components, the WPB said. The copper orders M-9-c and M-9-c-4 have been amended so that copper base alloy may now be used for the designated purposes. Corresponding changes in some of the limitation orders controlling the individual products have already been announced.

Extended Surface Heating Equipment

Removal of restrictions limiting the types and sizes of extended surface heating equipment that may be produced, together with other simplification restrictions, was announced by the WPB November 17. Schedule I of order L-107 (extended surface heating equipment) was revoked to remove the simplification restrictions. Order L-107 itself, which requires a rating of AA-5 or better and a specific delivery date before delivery can be made, still remains in effect. Extended surface heating equipment includes unit heaters, unit ventilators, convectors, blast heating coils, and special heating coils for space heating or for industrial heating or drying.

Fuel Oil Ration Order

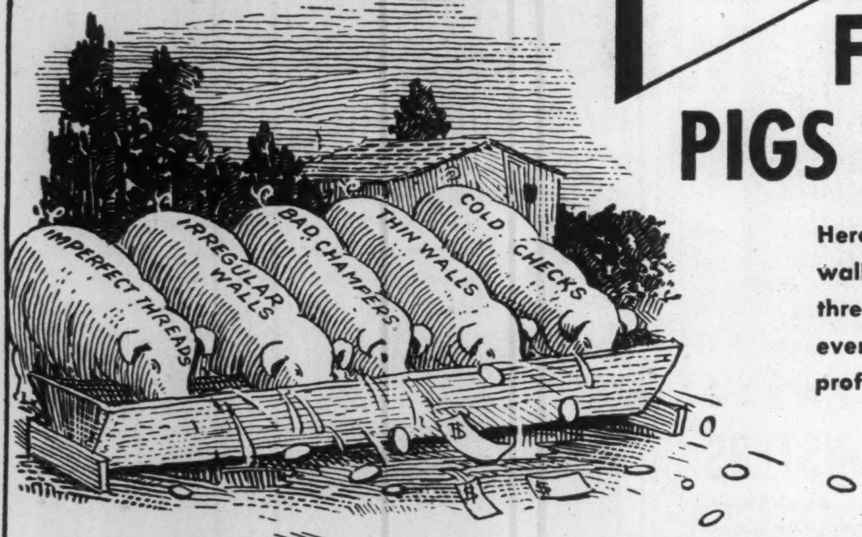
Amendment 30 to the fuel oil ration order (Rev. RO 11), effective November 6, rephrases the definition of a standby facility, and provides that:

"No ration shall be issued or used for the operation of central heating equipment furnishing heat or hot water, or for the operation of separate water heating equipment (for which application is made on OPA forms R-1100 (revised) or R-1101 (revised)), if:

"(1) The equipment is a new facility; or

"(2) In zones A-3, B-3 and C-3, the equipment is a reinstalled facility; or

"(3) In zones other than A-3, B-3, and C-3, the equipment is a reinstalled facility serving a premise other than a private dwelling, and the ration for the



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How to stop them! That's easy. Confine your fitting sources to responsible jobbers and you'll be supplied perfect fittings only.

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KUHNS BROTHERS CO.
DAYTON 7, OHIO

entire heating year during which the application is made would be 10,000 gal or more; or

"(4) There is a standby facility. If the standby facility is not in serviceable operating condition but can be placed in such condition at reasonable expense, an interim ration for the operation of the fuel oil burning equipment may be issued for the period ending on the earliest date when the standby facility can be placed in such condition."

Amendment 31, effective November 10, provides that if the standby facility is not adequate for the purpose for which the ration is sought, the allowable ration shall be reduced by the amount that can be saved by the use of the standby facility operated at maximum capacity.

This amendment also pertains to issuance of rations to ships, and use of ration checks by exempt agencies.

Amendment 32, effective November 23, is devoted to fuel oil bank accounts for OPA offices, use of checks, and exchange certificates.

Amendment 33, effective November 25, provides for granting advance rations of fuel oil to consumers while they are having central heating equipment reconverted to burn oil under the provision that recently made rations available to east coast and middle west consumers who cooperated in the original conversion program. The partial ration, OPA said, will be advanced to make it possible for consumers to have a supply of oil immediately available when the reconverted systems are ready for use. Because of labor and material shortages, consumers may be delayed in getting the work done on their converted systems, but under this provision there need be no further delay due to lack of fuel once the

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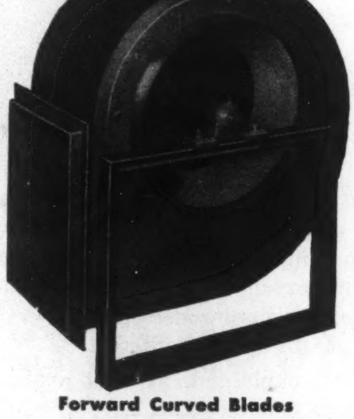

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*When pre-heated oils are burned the Petro Thermal Viscosity system insures consistent maximum combustion efficiency at all firing stages, automatically and reliably.

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As this style reducer can be furnished with foot or flange bases and assembled in **12 different mounting positions,** it can be easily installed without special adapters on almost any slow speed machine.

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It's a fine time to start, and you will be off to a *good* start with

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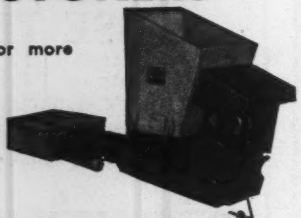

Models for factories, warehouses, public buildings, office buildings, apartment buildings, schools and churches.

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A GEHL WINS FRIENDS WHEREVER IT GOES

system is ready to burn it. For private dwellings, the advance ration will amount to 200 gal, and for premises other than private dwellings, 10 per cent of the annual ration, but not less than 200 gal. Private householders and other small volume users—those using an annual ration of less than 10,000 gal—are to apply to their local war price and rationing boards for the advance portion of their reconversion rations. Consumers who use more than 10,000 gal annually must first apply to the Petroleum Administration for War for an exception, and then present the exception order to the local board.

For the further information of householders and other small volume users, OPA explained last month how eligibility for fuel oil rations for reconverted heating equipment can be established. Eligibility is based on the applicant's having been a user of fuel oil who converted to coal or wood after July 31, 1942, which was the date when restrictions were first placed on oil used for heating purposes. In cases where local boards have information about the consumer's heating equipment—for example, where the board has on file the consumer's application for fuel oil rations requested in the early period of the rationing program—the board will probably know from its records whether the applicant, obviously a user of fuel oil, continued burning oil or converted. If these records establish conversion, the applicant is eligible. Lacking this type of proof, the consumer can present a statement from the person or firm that did the original conversion work, or a statement from a fuel oil dealer who supplied him before the system was converted.

Amendment 34 provides a revised procedure for issuing fuel oil "hardship" rations to consumers in the east coast and middle west areas, effective December 2. No increase in regular rations is involved, OPA emphasized. Instead, as was the case last year, a hardship ration will be issued only to consumers who have taken all reasonable measures to conserve oil but still need more for heat and hot water in order to avoid undue hardship.

The principal change made is that after an application is approved, local war price and rationing boards will issue a hardship ration sufficient to meet the consumer's needs for the balance of the heating season, rather than just a ration sufficient to tide him over until his next regular coupons become good. This will relieve the boards of having to review repeated applications from the same person in successive heating periods. It will save dealers numerous small deliveries and will be more convenient for consumers.

Hardship rations, OPA explained, are not available to consumers whose needs can be taken care of by the regular ration. Rather, they are designed for consumers who face heating problems which they cannot control or correct. Rationing experience has shown that some of these people have extra needs that are not temporary but will continue throughout the heating season. Since the total of their extra requirements can be figured fairly accurately, using a method based on consideration of the amount of oil and coupons on hand and the percentage of the heating season that has elapsed, a single hardship ration for the total extra need can be issued at one time.

Amendment 35 provides that fuel oil rations will be available in the east coast and middle west areas to eligible consumers who have space heating oil stoves that they acquired second-hand after the stove rationing program went into effect. OPA explained that this provision, effective November 28, will allow rations to a small additional group of consumers—those who bought used space heaters after August 23, 1943, which was the date when all new stoves were rationed.

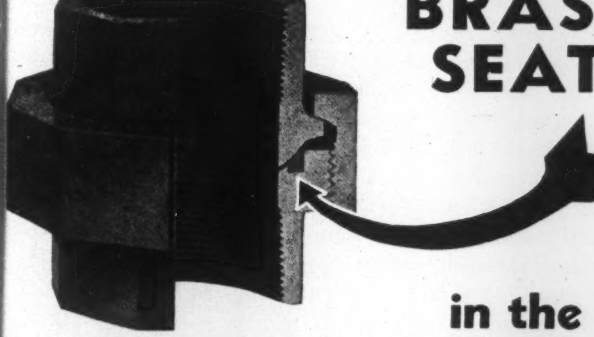
Heretofore, fuel oil rations for use in space heaters acquired after August 23, 1943, have been granted only to persons who could establish their need for a new space heater under the stove rationing regulations. This denied rations to most consumers who acquired nonrationed—that is, second-hand—space heaters.

Fuel Oil Supplies

Published statements that fuel oil supplies have become so abundant that larger rations will be justifiable next month or the first of the year were described November 13 by Petroleum Administrator Harold L. Ickes as "unfounded and regrettable." He said: "These statements, published in New York, were to the effect that more liberal heating oil rations were warranted because storage tanks in the east are full, and because the output of fuel oil is steadily increasing, even beyond the admittedly-growing military requirements.

"In refutation of these statements, I should like to cite the facts, and to remind again that only the PAW has all of the facts, including the figures on future military demands, which are obviously not publishable.

The RECESSED BRASS SEAT



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Hotel Pierre, New York City
Indiana State Library, Indianapolis, Ind.
Michigan Bell Telephone Co., Detroit, Mich.
Mt. Sinai Hospital, New York City
Museum of Art, Philadelphia, Pa.
Palmer House, Chicago, Ill.
S. H. Kress Stores
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Waldorf Astoria Hotel, New York City

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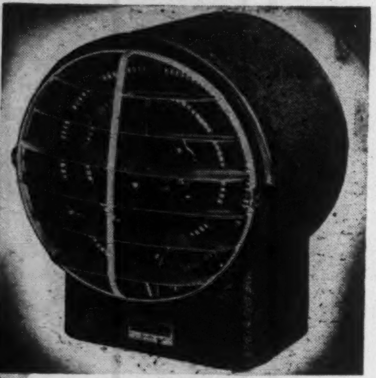

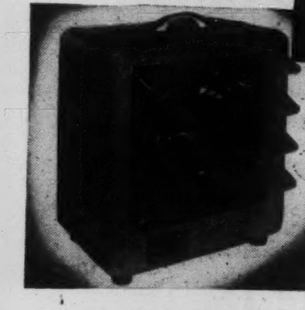

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For Large Rooms

Type CUB Chromalox heater, in four sizes—15 to 40 kw. Powerful blower drives air through Chromalox air blast heater. Circulating warm air streams can be directed as required. Blower can be operated without heater, for summer cooling. Thermostatic or manual control.

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Type UB Chromalox heater—eight sizes—2 to 15 kw. Ceiling or wall mount. Smaller sizes portable. Heating unit is the efficient Chromalox Koilfin. Protected against overheating by thermostatic switch. Other sizes and types available. Write

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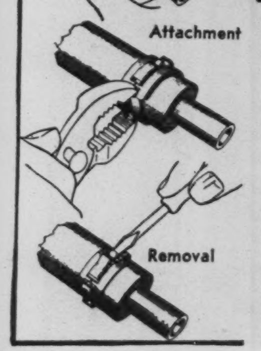

This new one piece hose clamp can be installed and removed *easier* and *faster* because of its simple but sturdy ratchet-type locking mechanism. It weighs less, has a lower profile, exerts uniform pressure and may be used over and over again. Approved by Army Air Forces and Navy Bureau of Aeronautics. Sizes from 1/2" O.D. up. ***Write for information.***

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"First—it is true that stocks of heating oil in the east are now 3,500,000 barrels higher than they were at this time last year, and that stocks in the midwest are 1,000,000 barrels higher.

"Second—it is also true that requirements, present and forthcoming, are higher than they were last year, particularly military requirements.

"Third—it is true, further, that we are facing a transportation situation that may become very tight before the winter is over.

"Fourth—because of the increased requirements, and because of the threatening transportation trouble, our best estimate is that supplies will be no more than enough to meet military demands, plus civilian requirements on the present ration basis."

Galvanized Sheets

Requirements for galvanized sheets have reached an alltime high, but the manpower shortage does not permit production to be increased accordingly, WPB representatives said at a recent meeting of the Galvanized Ware Manufacturers Industry Advisory Committee. WPB can offer no assurance that galvanized ware manufacturers will be able to obtain delivery of galvanized sheets to the extent of their current and 1945 quarterly allotments. Some open mill capacity for hot and cold rolled sheets for the first and second quarters of 1945 was reported by WPB representatives.

Heating and Plumbing Equipment

Four minor changes and corrections in the regulation governing ceiling prices of used and reconditioned plumbing and heating equipment were announced November 9 by the OPA. Effective November 13, 1944, the changes and corrections (Amendment 1 to MPR 546) are as follows: (1) The section that formerly exempted sales by government agencies from coverage of this regulation has been revoked. (2) A section of the original regulation made reference to the "second revised maximum export regulation" in relationship with import sales. The amendment corrects the error by making reference to the proper regulation—the maximum import price regulation. (3) The amendment makes clear that the specific method for pricing unlisted items covers the pricing, at both wholesale and retail, of used plumbing and heating equipment that does not meet the reconditioning requirements established by the regulation. In the absence of a manufacturer's list price, it is now specifically stated that the manufacturer's suggested retail price, if published prior to March 1942, may be used as the base for computing a wholesale or retail price for the item. (4) The amendment deletes from the section outlining the method for determining the ceiling price for type B reconditioned and guaranteed boilers and boiler repair parts an erroneous reference to automatic hot water heaters.

Housing

A supplemental form WPB-2896.2, to be used in conjunction with the present application form WPB-2896 for housing to be constructed in accordance with the H-2 program for congested war areas, was announced jointly November 15 by the WPB and the National

Housing Agency. Instructions on the supplemental form modify instructions on WPB-2896.

Under the H-2 program the National Housing Agency is permitted to approve shelter rental up to $65 a month and sale prices not to exceed $8000 where NHA determines such prices are required in order to provide an acceptable three-bedroom house. In many areas, the maximum sales and rental limits will be lower, as determined by NHA. Occupancy of housing built under the H-2 program is not limited to in-migrant war workers, but has been extended to anyone in need of such accommodations in congested war areas, WPB and NHA pointed out. Certification formerly required on WPB-2896 with regard to occupancy, rental, and sales limitations has been revised in the supplemental form in accordance with the policy change for H-2 housing.

Maintenance, Repair, and Operating Supplies

Governmental agencies and institutions will be able to obtain minor capital additions costing up to $500 under the provisions of controlled materials plan regulation 5A as amended November 7, the WPB has announced through the Office of Civilian Requirements' government bureau. The limit previously has been $100. Liberalization of the order, accomplished by amending paragraph (b) (6) and corresponding paragraphs in interpretations 5, 6, and 7, puts the agencies and institutions that use CMP 5A on the same basis as businesses and industries that have been operating under CMP 5 insofar as this provision is concerned, WPB said.

FREDERICK INDUSTRIAL STOKER

Hopper or Bin Feed. 200 to 850 lbs. per hour. Clinker or Side Dumping Grate.

SPEAKING ... *Mathematically*

Frederick's experience plus engineering knowledge and understanding of industry's needs results in a stoker which has subtracted from usual fuel consumption and multiplied savings for a long list of satisfied users.

This stoker is a real fuel saver. It is designed and constructed to get maximum heat from every ton of coal burned. Investigate the possibilities of the Frederick stoker . . . write for your copy of our Stoker Catalog . . . now.

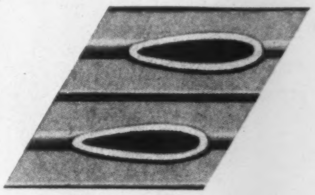
Stoker Builders Since 1918

THE *Frederick* IRON & STEEL CO.
Frederick, Maryland

HOT OFF THE PRESS!
fedders
Series 15
UNIT HEATERS

Announcing Series 15

UNIT HEATERS with Streamline COPPER TUBES AND FINS



Every man who specifies, sells, installs and uses unit heaters should know about the combined air handling and heat transfer efficiency of Fedders new Series 15 Models.

In addition, they provide extreme ruggedness resulting from advanced wartime metal brazing and fabricating skills.

Send for new Catalog 15C-1 just off the press.

FEDDERS
BUFFALO 7, N. Y.

Are Engineers Fussy?
"PUMPS by Aurora" Don't Mind

Every pump job is IMPORTANT. That's why we build ONLY fine pumps. The distinguished war record of Aurora Pumps is your assurance that post-war progress, too, will be aided by these superb performers.

Aurora Deep Well Turbines for all conditions—4" to 24"

Type AD Hor. Split Case, Two Stage Centrifugal

NSA Aurora Centrifugal Sump Pump

Type OD Hor. Split-Case Double Suction Single Stage Centrifugal

APCO TURBINE-TYPE PUMPS—the simplest of all pumps. Ideal for small capacity, high head duties. Silent, compact and lasting.

APCO Horizontal Condensation Return Unit

Type GMC Close-Coupled Centrifugal

Write for CONDENSED CATALOG OR

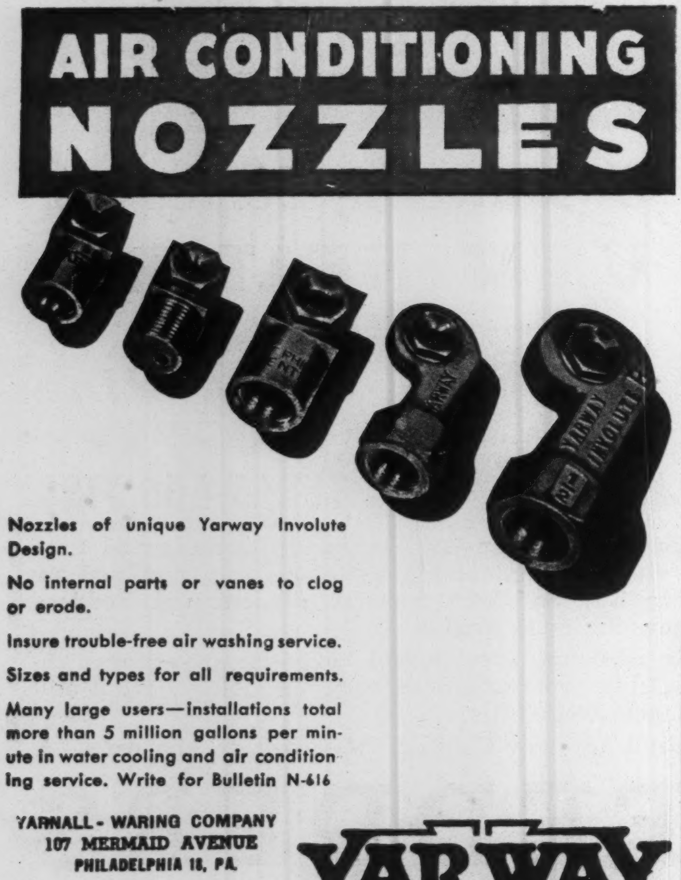
Type GGU Side Suction Single Stage Centrifugal

APCO Single Stage Turbine-Type

DISTRIBUTORS IN PRINCIPAL CITIES

AURORA PUMP COMPANY

80 Loucks Street, AURORA, ILLINOIS


AIR CONDITIONING NOZZLES

Nozzles of unique Yarway Involute Design.

No internal parts or vanes to clog or erode.

Insure trouble-free air washing service.

Sizes and types for all requirements.

Many large users—installations total more than 5 million gallons per minute in water cooling and air conditioning service. Write for Bulletin N-616

YARNALL-WARING COMPANY
107 MERMAID AVENUE
PHILADELPHIA 18, PA.

YARWAY

Pipe

An increase of approximately $8 a ton for sellers of re-usable iron and steel pipe in Georgia and New Mexico to compensate them for high freight costs was announced November 16 by the OPA. The re-usable pipe regulation sets up shipping point zones that establish ceiling prices for dealers in various areas of the country according to the normal freight rate structure. This setup has been found inadequate in the case of these two states. (Amendment 2 to MPR 230.)

Plumbing and Heating Division

C. Ray Davisson has been appointed director of the WPB's plumbing and heating division to replace Joseph F. Wilber, who resigned November 2 to return to his business as consultant engineer in Boston, WPB announced last month. Mr. Davisson has been serving as deputy director of the division since October 2, 1944. Prior to coming to WPB, Mr. Davisson was connected with the Carrier Corp.

Refrigeration and Air Conditioning Equipment

All applications by dealers for refrigeration and air conditioning equipment, including all self-contained package units, are being temporarily denied, the general industrial equipment division of the WPB announced November 18. These applications are made on WPB forms 541 and 547. The denials, however, will not affect applications for compressor bodies, low sides, and other repair components. This action was taken by WPB because of the unprecedented volume of applications for refrigeration and air conditioning equipment being received from dealers and distributors, officials said. The priority ratings previously granted for inventory purposes, together with the ratings received by dealers and distributors from ultimate consumers, have resulted in a large backlog of unfilled rated orders for several types of scarce equipment, they said. As a result, the critical components are not available in sufficient quantity to fill presently outstanding rated orders for complete assemblies within a reasonable length of time. During this temporary period, WPB officials explained, it will be necessary for dealers and distributors to extend ratings received from ultimate consumers to replace equipment sold from their inventories. In the meantime, they said, a study is being made by WPB of the problem and L-38 (general refrigeration and air conditioning) may be amended so that dealers and distributors can obtain a limited quantity of equipment for inventory.

Stoker and Oil Burner Repairs

Provisions of the regulation (MPR 165) establishing specific maximum hourly rates for oil burner maintenance and repair services have been broadened to include similar services for coal stokers with a capacity under 1200 lb per hr of coal, the OPA announced November 16. The hourly rates for stoker services (effective November 25), the same as those previously applying only to oil burner services, are:

	First Hour	Second and Succeeding Hours
In cities of 500,000 population or more	$2.50	$1.75
In cities of 100,000 to 500,000 population	2.00	1.50
In cities less than 100,000 population	1.50	1.25

The rates are inclusive of transportation, time spent in going to and from the job, and all other charges.

The hourly prices do not apply to suppliers of stoker maintenance and repair services who have established prices under revised maximum price regulation No. 165 at prices higher than the specific hourly rates, provided these suppliers have complied with the filing requirements of MPR 165.

That regulation establishes each seller's maximum price at the highest price charged by him during March 1942, for the same service to purchasers of the same class. It is required that the seller prepare and file with his local war price and rationing board a statement showing his maximum prices, rates, and pricing methods for stoker services supplied or offered during March 1942.

Studies made by OPA indicate that a great many suppliers have failed to file their maximum prices, and this action will establish definite maximum prices for stoker services where suppliers have failed to file statements under previous provisions.

This revised supplementary service regulation will also relieve dealers who during the base period (March 1942) rendered free stoker service in connection with their sales of stokers or coal. The proportion of free service performed to total stoker services varied widely from dealer to dealer and from region to region throughout the country. The rendering of free service depended primarily upon the competitive situation in a normal market rather than the cost or profit position of dealers in different areas.

BELLOWS ASSEMBLIES and SHAFT SEALS

hydraulically-formed for longer life!

For pressure or thermostatic bellows assembly applications requiring low spring rate, close dimensional tolerances, extreme sensitivity to temperature or pressure changes or for shaft seal assemblies where strength is essential to withstand torsional strain, high temperatures and pressures . . . your best bet is even-walled, pre-tested metallic bellows such as only hydraulic forming can produce.

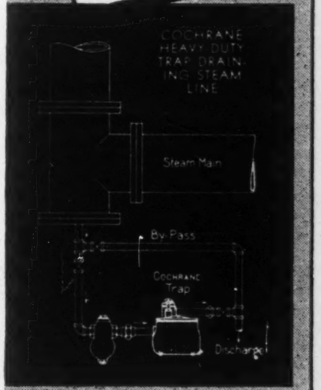
Clifford's Hydron was *industry's first hydraulically-formed bellows* . . . is still first choice for rigid specifications . . . because Clifford's experience in solving the difficult problems of producing, assembling or filling bellows assemblies and shaft seals saves time, trouble and money. For proof of Clifford's continued leadership, write for the 44-page Hydron Bellows Data Book — today. Clifford Manufacturing Company, 562 E. First Street, Boston 27, Mass.

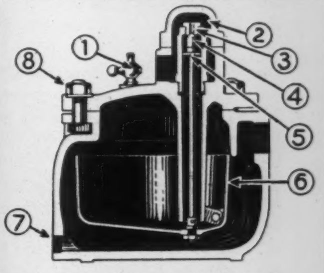
CLIFFORD

First with the Facts in Hydraulically-formed Bellows

HYDRON

COCHRANE *Drainage* EQUIPMENT


COCHRANE HEAVY DUTY TRAP DRAINING STEAM LINE
Steam Main
By-Pass
COCHRANE Trap
Discharge

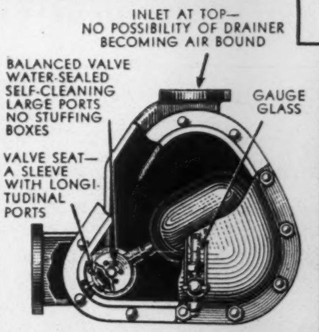


COCHRANE HEAVY-DUTY STEAM TRAP

1. Air removal vent cock
2. Removable valve bonnet
3. Easilychanged valve seat
4. Stainless steel valve
5. 4 centering arms
6. Large displacement bucket
7. Opening for drain or blow-off
8. Bolts for easy accessibility

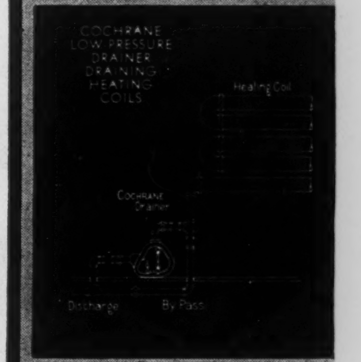
ADVANTAGES

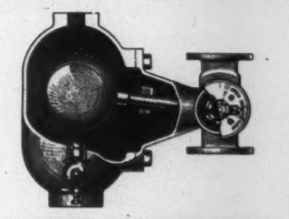
Only eight parts. Large cast-iron bucket holds valve tightly to seat until water overflows rim, opening valve wide. No levers, restricted passages or stuffing boxes to become clogged. Seat easily changed for various discharge rates. Write for Publication 2850.


INLET AT TOP—
NO POSSIBILITY OF DRAINER BECOMING AIR BOUND
BALANCED VALVE
WATER-SEALED
SELF-CLEANING
LARGE PORTS
NO STUFFING BOXES
GAUGE GLASS
VALVE SEAT—A SLEEVE WITH LONGITUDINAL PORTS

COCHRANE MULTIPORT DRAINER

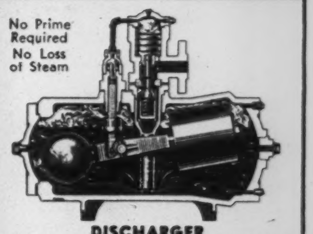
A low pressure drainer especially suited for operation at low differential pressures because of its very large port areas which provide a tremendously large discharge capacity. It uses a rotating cylindrical valve, directly attached to the float stem. Publication 2925 gives details.


COCHRANE LOW PRESSURE DRAINER DRAINING HEATING COILS
Heating Coil
COCHRANE Drainer
Discharge
By Pass



MULTIPORT DRAIN REGULATOR

Discharge regulated by height of condensate in body. Exceptionally large capacity.


No Prime Required
No Loss of Steam

DISCHARGER

For removing large quantities of condensate under high pressure (150 to 2000 lb./sq. in. or higher).

COCHRANE CORPORATION • 3131 N. 17th ST., PHILA., PA.

COCHRANE

More than a quarter million dollars plowed back to American industry

by One Allen Ventilating Unit . . .

Ventilation that does the job comes first with Allen. Close on the heels of that consideration comes lowered cost to the buyer. Only when we click on both are we satisfied, because only then do we know we've done a job.

Basically better ventilation engineering has enabled Allen to furnish industry with more than four thousand Allen Type "H" Roof Fans at an average saving of $62.50 per unit over the nearest comparable equipment—more than a quarter million dollars.

The explanation is simple. Allen patents cover the use of dampers balanced in the effluent air stream—open when the fan is running, closed automatically when power is off. This is in contrast to construction used by several other manufacturers wherein mechanical, motor-operated dampers are mandatory and up the cost.

Approximately 400 of these Allen units top the huge Willow Run Bomber Plant alone. Allen has an answer for your ventilation problem, too, whether it's ordinary or extraordinary. Let's talk it over. *The Allen Corporation, 9751 Erwin Avenue, Detroit 13, Michigan.*

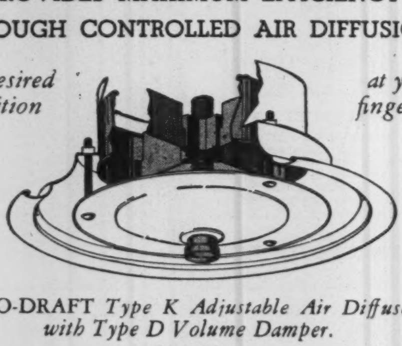
THE Allen CORPORATION

ENGINEERED VENTILATION FOR INDUSTRY

KNO-DRAFT

PROVIDES MAXIMUM EFFICIENCY THROUGH CONTROLLED AIR DIFFUSION

Any desired condition *at your finger tip*



KNO-DRAFT *Type K Adjustable Air Diffuser with Type D Volume Damper.*
Patented

All Kno-Draft Air Diffusers are also equipped with *air direction* adjustment to suit seasonal or individual requirements. Their engineered design insures more effective room air mixing, more uniform room temperature and controlled, noiseless, draftless air diffusion at low cost.

Write for descriptive folder D.

W. B. CONNOR ENGINEERING CORP.

114 East 32nd St. WB CONNOR ENGINEERING CORP. New York 16, N.Y.

Because of government restrictions on the sale of stokers and the inability of the dealer to supply fully the demands for coal, the requirement of the continuation of free services is believed by OPA to place an unreasonable burden on dealers. A shortage of labor and numerous increases in wages also make it inadvisable to continue the former requirements for free stoker services.

Service dealers whose hourly rates are less than the specific amounts listed in the amendment may adjust their ceilings to the applicable specific rate.

Yearly or contract oil burner or stoker services are not subject to the specific hourly rates, OPA added, but remain under the coverage of maximum price regulation No. 165—services.

Traps

Bodies of low pressure thermostatic radiator and drip traps, combination float and thermostatic traps, and boiler return traps may now be made of copper, the WPB announced November 3. Previously only cast iron could be used. Schedule VIII of order L-42, plumbing and heating simplification, was amended to make this change, in line with a recent WPB action that authorized sufficient copper for these low pressure traps as well as for many other civilian products.

Valves and Fittings

"One of the production miracles of the war!" is the way War Production Board officials describe the expansion of the valve and pipe fittings industries in order to meet the greatly expanded requirements of the Army and Navy, United States Maritime Commission, and the synthetic rubber and high octane gasoline programs. WPB officials cite the feat of changing over a so-called shelf-goods industry in peacetime to a "ship-from-assembly-lines" industry in wartime, and emphasize the "miraculous" production gains during the period from 1940 through 1943.

According to statistics released by the valve and fittings section, shipbuilding division, output showed the following increases in this period: Steel turbine valves, to almost five times the tonnage produced in 1940; all other steel valves, to more than five times; compressed gas cylinder valves, almost four times; brass and bronze valves, more than two times; iron body valves, almost two times; steel pipe fittings, almost three times.

"The general peak of demand for valves and fittings has passed, according to all present indications, although shortages of certain kinds of valves and fittings may appear from time to time," a shipbuilding division official said. "It is not possible, as long as material and manpower shortages exist, to meet promptly every demand for more than 100,000 different items produced by the industry, but essential and critical requirements are being met while the backlog of orders for the war effort is being reduced.

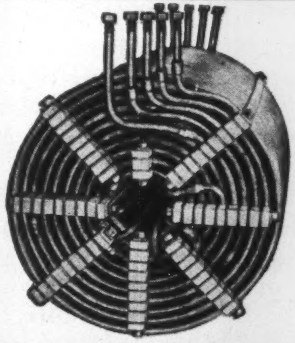
"It is expected that large surpluses of steel and brass valves will be reported by the procurement agencies as a result of changes in war programs, cutbacks, overordering, etc., when inventories are compiled. The productive capacity of the industry is now adequate to take care of all essential needs for the duration."

MEETINGS & CONVENTIONS

Refrigerating Engineers

American Society of Refrigerating Engineers, 40th annual meeting, December 10-13, Hotel Pennsylvania, New York City. The program includes papers on the history of refrigeration, by Harry Sloan, Vilter Mfg. Co.; heat operated refrigerated cycles, by Dr. R. S. Taylor, Servel, Inc.; moist air research, by Dean John A. Goff, Towne Scientific School, University of Pennsylvania; differential temperature expansion valves, by F. Y. Carter, Detroit Lubricator Co.; control of evaporative pressures, by Walter A. Grant, Carrier Corp.; pipe insulation for steady and intermittent refrigeration service, by W. P. Berggren and R. L. Perry, University of California; home freezers, by Dr. D. K. Tressler, General Electric Co.; quick freezing performance of an experimental subzero food freezer, by Prof. J. E. Nicholas, Pennsylvania State College; the future of commercial freezing, by Richard C. Poole, General Foods Corp.; powder metallurgy, by A. J. Langhammer, Airtemp Div., Chrysler Corp.; refrigeration for penicillin manufacture, by Clifford F. Holske, Vilter Mfg. Co.; and refrigeration as applied to lyophilization, by George A. Belsky, Mance Corp. Headquarters office of the ASRE is at 50 W. 40th St., New York 18, N. Y.

INTO THIS COIL ➡ WE BENT



half a mile of COPPER TUBING

Here's a job typical of Swan's skill in precision pipe and tube bending. A certain naval condenser unit takes a lot of copper tubing—two tons of it! *Half a mile of it!* To be bent into a coil no bigger than a small clothes closet. Thermal requirements for maximum efficiency of the unit make necessary the placement of the coil surfaces with great precision in all three dimensions.

Swan Engineering did it!
And in quantity!
And on time!

Use our advisory engineering service in connection with your bending problems. Swan Engineering will quote promptly on bending jobs large or small, simple or complicated, in any of the usual metals or alloys including stainless steel and aluminum. *Send your bending to Swan!*

SWAN ENGINEERING COMPANY, Inc.
746 Frelinghuysen Ave. Newark 5, N. J.

Watch the WOBBLY!

The FASTER he turns...
the BIGGER he Gets!

40 times as BIG

In rotating parts, a tiny amount of Dy-Namic Unbalance at low speeds, becomes a great destroying force even at speeds that are only slightly higher. For instance, an ounce of Dy-Namic Unbalance at 200 RPM multiplies itself nearly 40 times at 1200 RPM.

Drive Out the WOBBLIES
with the New
BEAR DY-NAMIC BALANCING

Drive Out the excessive wear, vibration and noise caused by couple-force action.

Hundreds of manufacturers are now using this new, easier, simpler, less costly way to rid Fans, Blowers, Motors, and other rotating parts of the couple-force action resulting from Dy-Namic Unbalance!

Bear Dy-Namic Balancing is being employed in two ways:—

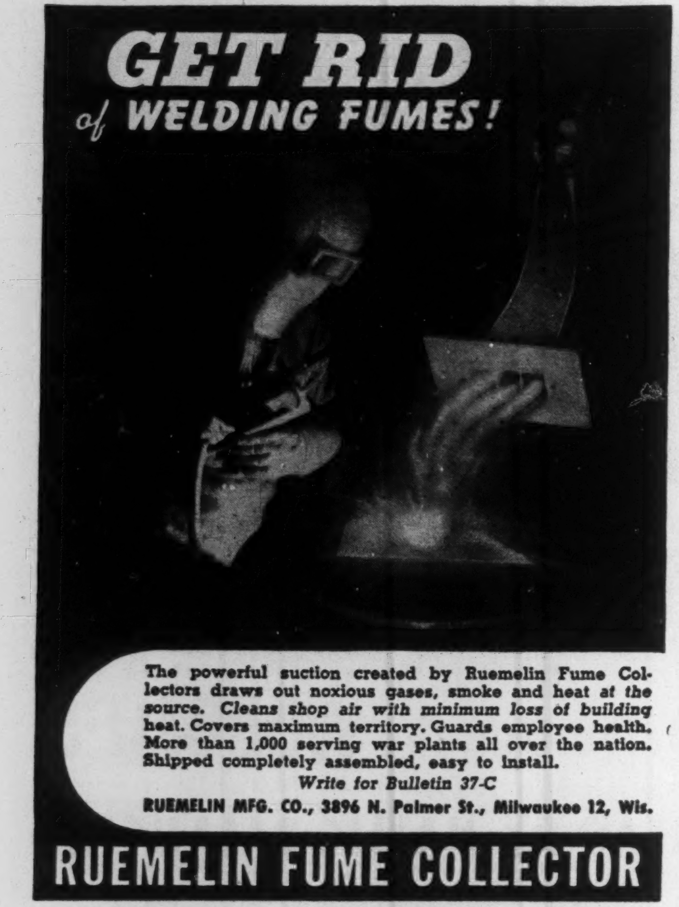
① **To improve product performance;** insure smoother operation and longer life of rotating parts.

② **To solve plant production problems;** reduce frequency of adjustment and repairs and eliminate costly power waste by Dy-Namically Balancing the rotating parts in production machinery.

Send for new FREE Data Folder, and write us in detail about your Balancing problems so that our engineering department can make proper recommendations. Address Bear Mfg. Co., Dept. HPA, Rock Island, Ill.

THE MARK OF PRECISION
P
BEAR

COMBINATION
STATIC AND DY-NAMIC BALANCING MACHINES



The powerful suction created by Ruemelin Fume Collectors draws out noxious gases, smoke and heat *at the source. Cleans shop air with minimum loss of building* heat. Covers maximum territory. Guards employee health. More than 1,000 serving war plants all over the nation. Shipped completely assembled, easy to install.

Write for Bulletin 37-C

RUEMELIN MFG. CO., 3896 N. Palmer St., Milwaukee 12, Wis.

RUEMELIN FUME COLLECTOR

A 4275-¼A

PRECISION PROCESSED
DOUBLE ADJUSTABLE GRILLES

Available in all standard sizes. Special sizes made to order. Write today for catalog of complete line of registers and grilles.

STANDFORATED

FOR PRODUCTION SPEED-UP— Specify Precision Processed STANFORATED Perforations. Industrial Screens, Filters, Guards, etc., made to specifications for vital industries. Handy catalog sent on request.

STANDARD STAMPING & PERFORATING CO.
3151 W. 49th PLACE · CHICAGO, ILLINOIS

AUTEMPCO
MOTORIZED
VALVES
Originators of
Electronic Controls
for
Heating Systems
INDOOR-OUTDOOR
TEMPERATURE
CONTROLS

AUTEMPCO CORP., 521 Fifth Ave., New York 17, N. Y.

Warm Air Heating

National Warm Air Heating and Air Conditioning Association, winter meeting, December 13-14, Statler Hotel, Cleveland. Headquarters office of the NWAHACA is at 145 Public Square, Cleveland, Ohio.

Louisiana Engineering Society

Louisiana Engineering Society, annual meeting, January 11-13, St. Charles Hotel, New Orleans. The program includes papers on supplying large war plants with power, water, gas, and compressed air, by A. H. Heitzler, assistant chief engineer, Cities Service Refining Corp.; and dehumidifying of air with coils, by Prof. Wm. Goodman, Illinois Institute of Technology (a member of HPAC's board of consulting and contributing editors). Headquarters office of the LSE is at Suite 422, St. Charles Hotel, New Orleans 12, La.

Heating and Ventilating Engineers

American Society of Heating and Ventilating Engineers, 51st annual meeting, January 22-24, Hotel Statler, Boston. For details, see ASHVE Journal Section in this issue. The secretary of the ASHVE is A. V. Hutchinson, 51 Madison Ave., New York 10, N. Y.

Testing Materials

American Society for Testing Materials, committee week, February 26-March 2, spring meeting, February 28, Hotel William Penn, Pittsburgh. Annual meeting, June 18-22, Hotel Statler, Buffalo, N. Y. The ASTM headquarters office is at 260 S. Broad St., Philadelphia 2, Pa.

Products of Tomorrow

First National "Products of Tomorrow" Exposition, to open approximately March 1, Chicago Coliseum. The general manager is Marcus W. Hinson, Chicago Coliseum, 1513 S. Wabash Ave., Chicago, Ill.

Midwest Power Conference

Midwest Power Conference, April 9-10, Palmer House, Chicago. Prof. S. E. Winston, Illinois Institute of Technology, 3300 Federal St., Chicago 16, Ill., is the conference director.

Foundrymen's Meeting

American Foundrymen's Association, 49th annual meeting, week of April 30-May 4, Detroit. No exhibit is planned in connection with the meeting. The headquarters office of the AFA is at 222 W. Adams St., Chicago 6, Ill.

District Heating

National District Heating Association, 36th annual meeting, Deshler-Wallick Hotel, Columbus, Ohio, to be held late in May or early in June. John F. Collins, Jr., 827 N. Euclid Ave., Pittsburgh 6, Pa., is secretary of the NDHA.

An index for the year 1944 for Heating, Piping & Air Conditioning will be ready soon. If you want a copy, send a postcard to The Editor, Heating, Piping & Air Conditioning, 6 N. Michigan Ave., Chicago 2, Illinois.

SECTION OF JANUARY 1944 HEATING, PIPING & AIR CONDITIONING

1944 DIRECTORY

of

HEATING, PIPING, AND AIR CONDITIONING EQUIPMENT

for

INDUSTRY AND LARGE BUILDINGS

PART 1—PRODUCTS CLASSIFIED—Page 228

If you want to know the names of one or more manufacturers making a certain product, look in Part 1, where products are classified alphabetically in "directory style" with the noun governing (for instance, "unit heaters" are listed under "heaters, unit").

PART 2—TRADE NAMES—Page 294

If you have the trade name of a product and want to know who manufacture it, look in Part 2, where trade names are alphabetically listed. Trade names the same as or identifiable from the company name are not listed. Manufacturers with such trade names can be easily identified under their product classification in Part 1.

PART 3—MANUFACTURERS' ADDRESSES—Page 308

For the complete name and address of any manufacturer look in Part 3.

● The manufacturers whose names are spotted throughout the listings advertise in this issue. See Index to Advertisers (on last page) for the page on which you will find the advertising of any of these manufacturers.

Heating, Piping & Air Conditioning
Chicago, Illinois

DIRECTORY SECTION

HEATING, PIPING AND AIR CONDITIONING EQUIPMENT FOR INDUSTRY AND LARGE BUILDINGS

PART 1—PRODUCTS CLASSIFIED

ABSORBERS, VIBRATION

See Hose, Metal, for Eliminating Compressor Vibration; Bases and Pads, Vibration Isolating

ABSORPTION DEHUMIDIFIERS

See Dehumidifiers, Absorption and Adsorption

ABSORPTION REFRIGERATION MACHINES

See Machines, Refrigeration, Absorption

ACCUMULATORS, REFRIGERATION (FOR AIR CONDITIONING)

Acme Industries, Inc., Jackson, Mich.
American Injector Co., Detroit, Mich.
Betz Engineering Co., Kansas City, Mo.
Boester, Carl F., St. Louis, Mo.
Frick Co., Waynesboro, Pa.
McQuay, Inc., Minneapolis, Minn.
Richmond Engineering Co., Inc., Richmond, Va.
Roessing Mfg. Co., Pittsburgh, Pa.
Vilter Mfg. Co., Milwaukee, Wis.
● Worthington Pump & Machinery Corp., Air Conditioning & Refrigeration Div., Harrison, N. J.
X L Refrigerating Co., Chicago, Ill.

ADJUSTABLE WRENCHES

See Wrenches, Adjustable

ADSORBERS, ODOR

Airkem Corp., New York, N. Y. (Chemical for counteracting odors)
Betz Corp., Hammond, Ind.
Carbide and Carbon Chemicals Corp., New York, N. Y.
Connor Engineering Corp., W. B., New York, N. Y.
Refinite Corp., Omaha, Neb.
Vapor Chemical Corp., New York, N. Y. (Chemical for counteracting odors)

ADSORPTION DEHUMIDIFIERS

See Dehumidifiers, Absorption and Adsorption

AFTERCOOLERS, COMPRESSED AIR

Adams Co., Inc., R. P., Buffalo, N. Y.
● Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American Locomotive Co., Alco Products Div., New York, N. Y.
Andale Co., Philadelphia, Pa.
● Bell & Gossett Co., Morton Grove, Ill.
Bethlehem Steel Co., Bethlehem, Pa.
Bury Compressor Co., Erie, Pa.
Chicago Pneumatic Tool Co., New York, N. Y.
Croll-Reynolds Engineering Co., Inc., New York, N. Y.
Downingtown Iron Works, Downingtown, Pa.
Howard Iron Works & Alberger Heater Co., Buffalo, N. Y.
● Ingersoll-Rand, New York, N. Y.
Johnson Corp., Three Rivers, Mich.
Parks-Cramer Co., Fitchburg, Mass.
● Patterson-Kelley Co., Inc., East Stroudsburg, Pa.
Pennsylvania Pump & Compressor Co., Easton, Pa.
Rome-Turney Radiator Co., Rome, N. Y.
Ross Heater & Mfg. Co., Inc., Buffalo, N. Y.
● Ruemelin Mfg. Co., Milwaukee, Wis.
Schutte & Koerting Co., Philadelphia, Pa.
Standard Heater & Oil Equipment Co., Jersey City, N. J.
Struthers Wells Corp., Titusville, Pa.
Tippett & Wood, Phillipsburg, N. J.
● Worthington Pump & Machinery Corp., Harrison, N. J.
● Young Radiator Co., Racine, Wis.
Zallea Brothers & Johnson, Wilmington, Del.

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AIR BREAK FITTINGS

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AIR WASHERS

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ALARMS, HIGH AND LOW BOILER WATER

Combustion Control Corp., Cambridge, Mass.
● Illinois Engineering Co., Chicago, Ill.
Johnson Corp., Three Rivers, Mich.
● Kieley & Mueller, Inc., North Bergen, N. J.
Lunkenheimer Co., Cincinnati, O.
McAlear Mfg. Co., Chicago, Ill.
● McDonnell & Miller, Chicago, Ill.
Mueller Steam Specialty Co., Inc., Long Island City, N. Y.
Schaub Engineering Co., Fred H., Chicago, Ill.
Wheelco Instruments Co., Chicago, Ill.
Wright-Austin Co., Detroit, Mich.
● Yarnall-Waring Co., Philadelphia, Pa.

ALARMS, SMOKE

American District Telegraph Co., New York, N. Y.
Au-Temp-Co Corp., New York, N. Y.
Bailey Meter Co., Cleveland, O.
Boiler Room Equipment, Inc., New York, N. Y.
Brooke Engineering Co., Inc., Philadelphia, Pa.
Cooper Co., Clark, Palmyra, N. J.
Photoswitch, Inc., Cambridge, Mass.
Preferred Utilities Co., Inc., New York, N. Y.
Worner Products Corp., Chicago, Ill.

ALUMINUM COATED SHEETS

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ALUMINUM SHEETS

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ANALYZERS, CARBON DIOXIDE, PORTABLE

Bacharach Industrial Instrument Co., Pittsburgh, Pa.
Barclay, Inc., Robert, Chicago, Ill.
Defender Automatic Regulator Co., St. Louis, Mo.
Dwyer Mfg. Co., F. W., Chicago, Ill.
Ellison Draft Gage Co., Chicago, Ill.
Engelhard, Inc., Chas., Newark, N. J.
● Hays Corp., Michigan City, Ind.
● Hotstream Heater Co., Cleveland, O.
Huyette Co., Inc., Paul B., Philadelphia, Pa.
Permutit Co., New York, N. Y.
Precision Control Co., San Francisco, Calif.
Precision Thermometer & Instrument Co., Philadelphia, Pa
Preferred Utilities Co., Inc., New York, N. Y.
Service to Industry, West Hartford, Conn.
Uehling Instrument Co., Paterson, N. J.
Weaver Mfg. Co., Springfield, Ill.

ANEMOMETERS

American Instrument Co., Silver Spring, Md.
Barclay, Inc., Robert, Chicago, Ill.
Friez Instrument Div., Bendix Aviation Corp., Towson, Md
Hill, E. Vernon, Chicago, Ill.
● Illinois Testing Laboratories, Inc., Chicago, Ill.
Taylor Instrument Companies, Rochester, N. Y.
Wallace & Tiernan Co., Inc., Newark, N. J.
Willson Products, Inc., Reading, Pa. (Thermometer type)

ANGLE VALVES

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ANGLES, BARS, BEAMS, CHANNELS AND TEES (LIGHT WEIGHT SHAPES)

Allegheny Ludlum Steel Corp., Brackenridge, Pa.
Aluminum Co. of America, Pittsburgh, Pa.
● American Brass Co., Waterbury, Conn.
Bethlehem Steel Co., Bethlehem, Pa.
Brasco Mfg. Co., Harvey, Ill.
● Byers Co., A. M., Pittsburgh, Pa.
● Carnegie-Illinois Steel Co., Pittsburgh, Pa.
Chase Brass & Copper Co., Waterbury, Conn.
Colonial Alloys Co., Metals Div., Philadelphia, Pa. (Stainless)
● Columbia Steel Co., San Francisco, Calif.
Decatur Iron & Steel Co., Decatur, Ala.
Inland Steel Co., Chicago, Ill.
International Steel Co., Evansville, Ind.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Laclede Steel Co., St. Louis, Mo.
Mesker & Co., Geo. L., Evansville, Ind.
Milcor Steel Co., Milwaukee, Wis.
Republic Steel Corp., Cleveland, O.
Revere Copper and Brass, Incorporated, New York, N. Y.
Ryerson & Son, Inc., Jos. T., Chicago, Ill.
● Tennessee Coal, Iron & Railroad Co., Birmingham, Ala.
Truscon Steel Co., Youngstown, O.
Weirton Steel Co., Weirton, W. Va.
Werner Co., Inc., R. D., New York, N. Y.
● Youngstown Sheet & Tube Co., Youngstown, O.

AQUASTATS

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ARC WELDERS

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ARC WELDING ELECTRODES

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ASBESTOS FIBER AND CEMENT PIPE

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ASBESTOS PACKING

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ASH CONVEYORS

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BALANCING EQUIPMENT

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BALANCING VALVES

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BALL BEARINGS

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BAROMETRIC CONTROLS

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BASES, MOTOR, TENSION ADJUSTING

Ackermann Mfg. Co., Wheeling, W. Va.
Alexander Bros., Philadelphia, Pa.
● Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American Pulley Co., Philadelphia, Pa.
Browning Mfg. Co., Inc., Maysville, Ky.
General Electric Co., Schenectady, N. Y.
Manley Products Corp., York, Pa.
Maysteel Products, Inc., Mayville, Wis.
● Rhoads & Sons, J. E., Philadelphia, Pa.
Rockwood Mfg. Co., Indianapolis, Ind.

BASES AND PADS, VIBRATION ISOLATING

Armstrong Cork Co., Lancaster, Pa.
● Buffalo Forge Co., Buffalo, N. Y.
● Clarage Fan Co., Kalamazoo, Mich.
Cork Import Corp., New York, N. Y.
Cork Insulation Co., Inc., New York, N. Y.
Ehret Magnesia Mfg. Co., Valley Forge, Pa.
Felters Co., Inc., Boston, Mass.
Firestone Tire & Rubber Co., Akron, O.
Gates Rubber Co., Denver, Col.
Goodrich Co., B. F., Akron, O.
Johns-Manville, New York, N. Y.
Keldur Corp., New York, N. Y.
Korfund Co., Long Island City, N. Y.
Lord Mfg. Co., Erie, Pa.
Manley Products Corp., York, Pa.
● Mundet Cork Corp., Brooklyn, N. Y.
National Lead Co., New York, N. Y.
United Cork Companies, Lyndhurst, N. J.
United States Rubber Co., New York, N. Y.
● Vibration Eliminator Co., Astoria, N. Y.
Vibration Engineering Co., The, New York, N. Y.
Western Felt Works, Chicago, Ill.

BEARINGS, BALL

Ahlberg Bearing Co., Chicago, Ill.
Bantam Bearings Div., The Torrington Co., South Bend, Ind
Bearings Co. of America, Lancaster, Pa.
Dodge Mfg. Corp., Mishawaka, Ind.
Fafnir Bearing Co., New Britain, Conn.
● Link-Belt Co., Indianapolis, Ind.
Marlin-Rockwell Corp., Jamestown, N. Y.
New Departure Div., General Motors Corp., Bristol, Conn.
Nice Ball Bearing Co., Philadelphia, Pa.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
SKF Industries, Inc., Philadelphia, Pa.
Schatz Mfg. Co., Fairview, Poughkeepsie, N. Y.
Shafer Bearing Corp., Chicago, Ill.
● Stephens-Adamson Mfg. Co., Aurora, Ill.
Wood's Sons Co., T. B., Chambersburg, Pa.

BEARINGS, PILLOW BLOCK

Ahlberg Bearing Co., Chicago, Ill.
Air Controls, Inc., Cleveland, O.
Caldwell Co., W. E., Louisville, Ky.
Central Die Casting & Mfg. Co., Inc., Chicago, Ill.
Chain Belt Co., Milwaukee, Wis.
Chicago Die Casting Mfg. Co., Chicago, Ill.
Clizbe Bros. Mfg. Co., Plymouth, Ind.
Dick Co., Inc., R. & J., Passaic, N. J.
Dodge Mfg. Corp., Mishawaka, Ind.
Fafnir Bearing Co., New Britain, Conn.
● General Motors Corp., Moraine Products Div., Dayton, O.
Goldens' Foundry & Machine Co., Columbus, Ga.
Jeffrey Mfg. Co., Columbus, O.
Jones Foundry & Machine Co., W. A., Chicago, Ill.
Lau Blower Co., Dayton, O.
● Link-Belt Co., Indianapolis, Ind.
Medart Co., St. Louis, Mo.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
● Randall Graphite Products Corp., Chicago, Ill.
Royersford Foundry & Machine Co., Inc., Royersford, Pa.
SKF Industries, Inc., Philadelphia, Pa.
Shafer Bearing Corp., Chicago, Ill. (self aligning)
Smith, Inc., Winfield H., Springville, N. Y.
Sprout, Waldron & Co., Muncy, Pa.
Standard Pressed Steel Co., Jenkintown, Pa.
● Stephens-Adamson Mfg. Co., Aurora, Ill.
Triangle Mfg. Co., Oshkosh, Wis.
Viking Air Conditioning Corp., Cleveland, O.
Wood's Sons Co., T. B., Chambersburg, Pa.

BEARINGS, ROLLER

Ahlberg Bearing Co., Chicago, Ill.
Bantam Bearings Div., The Torrington Co., South Bend, Ind
Dodge Mfg. Corp., Mishawaka, Ind.
Hyatt Bearings Div., General Motors Corp., Harrison, N. J.
Jones Foundry & Machine Co., W. A., Chicago, Ill.
● Link-Belt Co., Indianapolis, Ind.
Medart Co., St. Louis, Mo.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
Roller Bearing Co. of America, Trenton, N. J.
Royersford Foundry & Machine Co., Inc., Royersford, Pa.
SKF Industries, Inc., Philadelphia, Pa.
Shafer Bearing Corp., Chicago, Ill. (self aligning)

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- Timken Roller Bearing Co., Canton, O.
- Torrington Co., The, Torrington, Conn. (Needle roller)
- Wood's Sons Co., T. B., Chambersburg, Pa.

BEARINGS, SLEEVE

- Dodge Mfg. Co., Mishawaka, Ind.
- Federal-Mogul Corp., Detroit, Mich.
- ● General Motors Corp., Moraine Products Div., Dayton, O.
- Johnson Bronze Co., New Castle, Pa.
- Keystone Carbon Co., Inc., St. Marys, Pa.
- Medart Co., St. Louis, Mo.
- Motex Metal Process Corp., Detroit, Mich.
- ● Randall Graphite Products Corp., Chicago, Ill.
- Wood's Sons Co., T. B., Chambersburg, Pa.

BELLOWS, THERMOSTATIC

- Bishop & Babcock Mfg. Co., Cleveland, O.
- Bridgeport Thermostat Co., Inc., Bridgeport, Conn.
- Cashin Co., W. D., Boston, Mass.
- Chicago Metal Hose Corp., Maywood, Ill.
- Clifford Mfg. Co., Boston, Mass.
- Cook Electric Co., Chicago, Ill.
- ● Fulton Sylphon Co., Knoxville, Tenn.

BELTING, FLAT, LEATHER

- Alexander Bros., Inc., Philadelphia, Pa.
- Baldwin Belting, Inc., New York, N. Y.
- Chicago Belting Co., Chicago, Ill.
- Graton & Knight Co., Worcester, Mass.
- Houghton & Co., E. F., Philadelphia, Pa.
- ● Rhoads & Sons, J. E., Philadelphia, Pa.
- Schieren Co., Chas. A., New York, N. Y.
- Williams & Son, I. B., Dover, N. H.

BELTING, FLAT, RUBBER

- Boston Woven Hose & Rubber Co., Cambridge, Mass.
- Continental Rubber Wks., Erie, Pa.
- Dick Co., Inc., R. & J., Passaic, N. J.
- Firestone Tire & Rubber Co., Akron, O.
- Garlock Packing Co., Palmyra, N. Y.
- Gilmer Co., L. H., Philadelphia, Pa.
- Goodrich Co., B. F., Akron, O.
- Goodyear Tire & Rubber Co., Akron, O.
- Hamilton Rubber Mfg. Co., Trenton, N. J.
- Jeffrey Mfg. Co., Columbus, O.
- Manhattan Rubber Mfg. Co., Div. of Raybestos-Manhattan, Inc., Passaic, N. J.
- Manheim Mfg. & Belting Co., Manheim, Pa.
- Quaker Rubber Corp., Philadelphia, Pa.
- Republic Rubber Div., Lee Rubber & Tire Corp., Youngstown, O.
- Rockwood Mfg. Co., Indianapolis, Ind.
- Thermoid Rubber, Div. of Thermoid Co., Trenton, N. J.
- United States Rubber Co., New York, N. Y.

BELTS, V

- ● Allis-Chalmers Mfg. Co., Milwaukee, Wis.
- American Pulley Co., Philadelphia, Pa.
- Baldwin Belting, Inc., New York, N. Y.
- Browning Mfg. Co., Inc., Maysville, Ky.
- Chicago Belting Co., Chicago, Ill.
- Continental Rubber Wks., Erie, Pa.
- Dayton Rubber Mfg. Co., Dayton, O.
- Dick Co., Inc., R. & J., Passaic, N. J.
- Dodge Mfg. Corp., Mishawaka, Ind.
- Firestone Tire & Rubber Co., Akron, O.
- Gates Rubber Co., Denver, Colo.
- Gilmer Co., L. H., Philadelphia, Pa.
- Goodrich Co., B. F., Akron, O.
- Goodyear Tire & Rubber Co., Akron, O.
- Graton & Knight Co., Worcester, Mass.
- Jones Foundry & Machine Co., W. A., Chicago, Ill.
- Manhattan Rubber Mfg. Co., Div. of Raybestos-Manhattan, Inc., Passaic, N. J.
- Manheim Mfg. & Belting Co., Manheim, Pa.
- Medart Co., St. Louis, Mo.
- Republic Rubber Div., Lee Rubber & Tire Corp., Youngstown, O.
- Rockwood Mfg. Co., Indianapolis, Ind.
- Schieren Co., Chas. A., New York, N. Y.
- Thermoid Rubber, Div. of Thermoid Co., Trenton, N. J.
- United States Rubber Co., New York, N. Y.
- Wood's Sons Co., T. B., Chambersburg, Pa.
- ● Worthington Pump & Machinery Corp., Harrison, N. J.

BENDERS, PIPE

- ● American Pipe Bending Machine Co., Inc., Boston, Mass.
- American Pipe Tool Co., Chicago, Ill.
- Armstrong Mfg. Co., Bridgeport, Conn.
- Beaton & Corbin Mfg. Co., Southington, Conn.
- Bernz Co., Inc., Otto, Rochester, N. Y.
- Blackhawk Mfg. Co., Milwaukee, Wis.
- ● Buffalo Forge Co., Buffalo, N. Y.
- Chase Brass & Copper Co., Waterbury, Conn.
- Crown Die & Tool Co., Chicago, Ill. (Hand)
- Greenlee Tool Co., Rockford, Ill.
- Holsclaw Bros., Inc., Evansville, Ind.
- Hossfeld Mfg. Co., Winona, Minn.
- ● O'Neil Irwin Mfg. Co., Minneapolis, Minn.
- ● Pedrick Tool & Machine Co., Philadelphia, Pa.
- Pines Engineering Co., Inc., Aurora, Ill.
- Shaw-Kendall Engineering Co., Toledo, O.
- Tal's Prestal Bender, Inc., Milwaukee, Wis.
- Toledo Pipe Threading Machine Co, Toledo, O.
- Vanderman Mfg. Co., Willimantic, Conn.
- ● Wallace Supplies Mfg. Co., Chicago, Ill.
- Watson-Stillman Co., Roselle, N. J.

BENDERS, TUBING

- ● American Pipe Bending Machine Co., Inc., Boston, Mas
- Armstrong Mfg. Co., Bridgeport, Conn.
- Beaton & Corbin Mfg. Co., Southington, Conn.
- Bernz Co., Inc, Otto, Rochester, N. Y.
- ● Buffalo Forge Co., Buffalo, N. Y.
- Chase Brass & Copper Co., Waterbury, Conn.
- Conklin Brass & Copper Co., Inc., T. E., New York, N. Y
- Greenlee Tool Co., Rockford, Ill.
- Griffith Equipment Co., Inc., Los Angeles, Calif.
- Hays Mfg. Co., Erie, Pa. (Copper Tube)
- Holsclaw Bros., Inc., Evansville, Ind.
- Hossfeld Mfg. Co., Winona, Minn.
- Imperial Brass Mfg. Co., Chicago, Ill.
- Martin & Sons, H. P., Owensboro, Ky.
- ● O'Neil Irwin Mfg. Co., Minneapolis, Minn.
- Parker Appliance Co., Cleveland, O.
- ● Pedrick Tool & Machine Co, Philadelphia, Pa.
- Perfection Refrigeration Parts Co., Harvey, Ill.
- Pines Engineering Co., Inc., Aurora, Ill.
- Sac Tool Mfg. Co., St. Louis, Mo.
- Snap-On Tools Corp., Kenosha, Wis.
- Steel City Electric Co., Pittsburgh, Pa.
- ● Wallace Supplies Mfg. Co., Chicago, Ill.
- Watson-Stillman Co., Roselle, N. J.

BENDS, EXPANSION, STEAM PIPE

- American Locomotive Co, Alco Products Div., New York, N. Y
- Chicago Nipple Mfg. Co., Chicago, Ill.
- Clow & Sons, James B., Chicago, Ill.
- ● Crane Co., Chicago, Ill.
- ● Ellsworth Pipe & Supply Co., Milwaukee, Wis.
- ● Flori Pipe Co., The, St. Louis, Mo.
- ● Grinnell Co., Inc., Providence, R. I.
- Harris & Co., Arthur, Chicago, Ill. (Stainless & non-ferrous)
- Harrisburg Steel Corp., Harrisburg, Pa.
- Kellogg Co., M. W., The, New York, N. Y. (Corrugated steel)
- Limbert & Co., Geo. B., Chicago, Ill.
- Lumsden & Van Stone Co., South Boston, Mass.
- Metal Products Fabricating Co., San Francisco, Calif.
- ● Midwest Piping & Supply Co., Inc., St. Louis, Mo.
- National Pipe Bending Co., New Haven, Conn.
- National Valve & Mfg. Co., Pittsburgh, Pa.
- Ohio Pipe Bending & Machine Co., Cleveland, O.
- Parks-Cramer Co., Fitchburg, Mass.
- Pittsburgh Pipe Coil & Bending Co., Etna, Pa.
- Pittsburgh Piping & Equipment Co., Pittsburgh, Pa.
- Power Piping Div., Blaw-Knox Co., Pittsburgh, Pa.
- Rempe Co., Chicago, Ill.
- ● Ric-wiL Co., Cleveland, O.
- Roessing Mfg. Co., Pittsburgh, Pa.
- Sales & Co., Murray W., Detroit, Mich.
- Shaw Co., Benjamin F., Wilmington, Del.
- Shaw-Kendall Engineering Co., Toledo, O.
- ● Walworth Co., New York, N. Y.

BI-METALS, THERMOSTATIC

- Chace Co., W. M., Detroit, Mich.
- General Plate Div., Metals & Controls Corp., Attleboro, Mass
- Wilson Co., H. A., The, Newark, N. J.

BLACKOUT VENTILATORS

See Ventilators, Blackout

BLADES, PROPELLER FAN

- Ackermann Mfg. Co., Wheeling, W. Va.
- Aerovent Fan Co., Piqua, O.
- Air Controls, Inc., Cleveland, O.
- Aire-Foile Fan & Blower Co., Detroit, Mich.
- Airmaster Corp., Chicago, Ill.
- ● Allen Corp., Detroit, Mich.
- Belanger Fan & Blower Co., Detroit, Mich.
- Champion Blower & Forge Co., Lancaster, Pa.
- ● Chelsea Fan & Blower Co., Irvington, N. J.
- Circulators & Devices Mfg. Corp., New York, N. Y.
- Dallas Engineering Co., Inc., Dallas, Tex.
- ● DeBothezat Ventilating Equipment Div., American Machine & Metals, Inc., East Moline, Ill.
- Dual Air Fan Co., Chicago, Ill.
- Economy Electric Mfg. Co., Chicago, Ill.
- Electrovent Fan & Mfg. Co., Chicago, Ill.
- International Engrg., Inc., Dayton, O.
- Jeffrey Mfg. Co., Columbus, O.
- La-Del Conveyor & Mfg. Co., New Philadelphia, O.
- Lohman Co., Wm. J., Irvington, N. J.
- Meier Electric & Machine Co., Indianapolis, Ind.
- Myers Electric Co., Inc., Pittsburgh, Pa.
- Norwin Co., Freeport, Ill.

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Peerless Electric Co., Warren, O.
Propellair, Inc., Springfield, O.
Schwitzer-Cummins Co., Indianapolis, Ind.
South Bend Air Products Corp., South Bend, Ind.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Swift Mfg. Co., Detroit, Mich.
Torrington Mfg. Co., Torrington, Conn.
Utility Fan Corp., Los Angeles, Calif.
Victor Electric Products, Inc., Cincinnati, O.

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BLAST HEATERS

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BLAST HEATING COILS

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BLOWER FANS

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BLOWER WHEELS

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BLOWERS, HIGH PRESSURE

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Allen Billmyre Co., Mamaroneck, N. Y.
● Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American Blower Corp., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Beach-Russ Co., New York, N. Y.
● Buffalo Forge Co., Buffalo, N. Y.
Carling Turbine Blower Co., Worcester, Mass.
Champion Blower & Forge Co., Lancaster, Pa.
● Chelsea Fan & Blower Co., Irvington, N. J.
Circulators & Devices Mfg. Corp., New York, N. Y.
● Clarage Fan Co., Kalamazoo, Mich.
Dynamic Air Engineering, Inc., Los Angeles, Calif.
Eclipse Fuel Engineering Co., Rockford, Ill.
Garden City Fan Co., Chicago, Ill.
● Ingersoll-Rand Co., New York, N. Y.
L-R Mfg. Co., Blower Div., Torrington, Conn.
Lammert & Mann Co., Chicago, Ill.
Lohman Co., Wm. J., Irvington, N. J.
Muncie Gear Wks., Muncie, Ind.
National Machine Works, Chicago, Ill.
North American Mfg. Co., Cleveland, O.
Roots-Connersville Blower Corp., Connersville, Ind.
Spencer Turbine Co., Hartford, Conn.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Trimount Rotary Power Co., East Bedham, Mass.
Utility Fan Corp., Los Angeles, Calif.
Western Blower Co., Seattle, Wash.
● Wing Mfg. Co., L. J., New York, N. Y.

BLOWERS, SOOT

Bayer Co., St. Louis, Mo.
Diamond Power Specialty Corp., Detroit, Mich.
Huyette Co., Inc., Paul B., Philadelphia, Pa.
Perfection Grate & Stoker Co., Springfield, Mass.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

BLOW-OFF VALVES

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BLUE PRINT MACHINES

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BOILER CLEANING COMPOUNDS

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BOILER FEEDERS

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BOILER OBSERVATION PORTS

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BOILER AND TANK INSULATION

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BOILER TUBES

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BOILER WATER ALARMS

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BOILERS, HEATING, CAST IRON, SECTIONAL

2000 Sq Ft Steam Radiation and Over

American Radiator & Standard Sanitary Corp., Pittsburgh, Pa
Bryan Steam Corp., Peru, Ind.
● Bryant Heater Co., The, Cleveland, O.
● Burnham Boiler Corp., Irvington, N. Y.
Columbia Radiator Co., McKeesport, Pa.
● Crane Co., Chicago, Ill.
Eastern Foundry Co., Peerless Heater Div., Boyertown, Pa
Herbert Boiler Co., Chicago, Ill.
International Heater Co., Utica, N. Y.
Kohler Co., Kohler, Wis.
National Radiator Co., The, Johnstown, Pa.
Pierce Butler Radiator Corp., Syracuse, N. Y.
● Prox Co., Inc., Frank, Terre Haute, Ind.
Richmond Radiator Co., Gas Products Div., Uniontown, Pa.
● Smith Co., Inc., H. B., The, Westfield, Mass.
Spencer Heater Div., The Aviation Corp., Williamsport, Pa.
Thatcher Furnace Co., Garwood, N. J.
United States Radiator Corp., Detroit, Mich.
Weil-McLain Co., Chicago, Ill.

BOILERS, HEATING, STEEL, FIRE TUBE

2000 Sq Ft Steam Radiation and Over

Ames Iron Wks., Div. of Pierce Butler Radiator Corp., Oswego N. Y.
Atlantic Steel Boiler Co., Philadelphia, Pa.
Bass Foundry & Machine Co., Ft. Wayne, Ind.
Bigelow Co., New Haven, Conn.
Bros Boiler & Mfg. Co., Wm., Minneapolis, Minn.
Brownell Co., Dayton, O.
● Burnham Boiler Corp., Irvington, N. Y.
Cleaver-Brooks Co., Milwaukee, Wis.
Combination Boiler Co., Benton Harbor, Mich.
Combustion Engineering Co., Inc., New York, N. Y.
Dillon Steam Boiler Wks., Inc., D. M., Fitchburg, Mass.
Erie City Iron Wks., Erie, Pa.
Farrar & Trefts, Buffalo, N. Y.
● Fitzgibbons Boiler Co., Inc., New York, N. Y.
Frost Mfg. Co., Galesburg, Ill.
Gallaher Boiler Co., St. Louis, Mo.
General Furnaces Corp., New York, N. Y.
Hodge Boiler Wks., East Boston, Mass.
International Boiler Wks. Co., East Stroudsburg, Pa.
International Engineering Wks., Inc., Framingham, Mass.
Johnston Bros., Inc., Ferrysburg, Mich.
Keeler Co., Williamsport, Pa.
● Kewanee Boiler Corp., Kewanee, Ill.
Kisco Boiler & Engineering Co., St. Louis, Mo.
Leffel & Co., Springfield, O.
Lookout Boiler & Mfg. Co., Chattanooga, Tenn.
Manitowoc Boiler Wks., Manitowoc, Wis.
Murray Iron Wks. Co., Burlington, Ia.
National Radiator Co., The, Johnstown, Pa.
● Orr & Sembower, Inc., Reading, Pa.
Pacific Steel Boiler Div., United States Radiator Corp., Detroit, Mich.
Sellers Engineering Co., Chicago, Ill.
Smith Twin Tubular Boiler Co., Inc., Philadelphia, Pa.
Spencer Heater Div., The Aviation Corp., Williamsport, Pa.
Titusville Iron Wks. Co., Titusville, Pa.
Union Iron Wks., Erie, Pa.
Vortex Mfg. Co., Portland, Ore.
Wickes Boiler Co., Saginaw, Mich.

BOILERS, HEATING, STEEL, WATER TUBE

Anetsberger Bros., Chicago, Ill.
Atlantic Steel Boiler Co., Philadelphia, Pa.
Babcock & Wilcox Co., New York, N. Y.
Bass Foundry & Machine Co., Ft. Wayne, Ind.
Bros Boiler & Mfg. Co., Wm., Minneapolis, Minn.
Bryan Steam Corp., Peru, Ind.
Combination Boiler Co., Benton Harbor, Mich.
Combustion Engineering Co., Inc., New York, N. Y.
Edge Moor Iron Wks., Inc., New York, N. Y.
Erie City Iron Wks., Erie, Pa.
International Boiler Wks. Co., East Stroudsburg, Pa.
International Engineering Wks., Inc., Framingham, Mass.
Keeler Co., E., Williamsport, Pa.
Koven & Bro., Inc., L. O., Jersey City, N. J.
Murray Iron Wks. Co., Burlington, Ia.
● Orr & Sembower, Inc., Reading, Pa.
Riley Stoker Corp., Worcester, Mass.
Smith Twin Tubular Boiler Co., Inc., Philadelphia, Pa.
Spencer Heater Div., The Aviation Corp., Williamsport, Pa.
Super Mold Corp., Lodi, Calif.
Titusville Iron Wks. Co., Titusville, Pa.
Union Iron Works, Erie, Pa.
Vapor Car Heating Co., Inc., Chicago, Ill.
Waterfilm Boilers, Inc., Jersey City, N. J.
Wickes Boiler Co., Saginaw, Mich.

● Advertisement in this issue. See Index to Advertisers, page 322.

BOILERS, STEAM GENERATING UNITS, HEATING AND PROCESS

- Ames Iron Works, Div. of Pierce Butler Radiator Corp., Oswego, N. Y.
- Clayton Mfg. Co., Alhambra, Calif.
- Cleaver-Brooks Co., Milwaukee, Wis.
- Eclipse Fuel Engineering Co., Rockford, Ill.
- General Furnaces Corp., New York, N. Y.
- International Boiler Works Co., East Stroudsburg, Pa.
- Johnson Co., S. T., Oakland, Calif.
- Johnston Bros., Inc., Ferrysburg, Mich.
- Leffel & Co., James, Springfield, O.
- Lookout Boiler & Mfg. Co., Chattanooga, Tenn.
- Mears-Kane-Ofeldt, Inc., Philadelphia, Pa.
- Murray Iron Works Co., Burlington, Ia.
- ● Orr & Sembower, Inc., Reading, Pa.
- Preferred Utilities Co., Inc., New York, N. Y.
- ● Smith Co., Inc., H. B., The, Westfield, Mass.
- Thermal Engineering Co., Chicago, Ill.
- Vapor Car Heating Co., Inc., Chicago, Ill.
- Vogt Machine Co., Henry, Louisville, Ky.

BOLTS, EXPANSION

- Chase Brass & Copper Co., Waterbury, Conn.
- Chicago Expansion Bolt Co., Chicago, Ill.
- Diamond Expansion Bolt Co., Inc., Garwood, N. J.
- Fee & Mason Mfg. Co., Inc., New York, N. Y.
- National Lead Co., New York, N. Y.
- Ohio Brass Co., Mansfield, O.
- Paine Co., Chicago, Ill.
- Rawlplug Co., Inc., The, New York, N. Y.
- Rolyan Corp., Chicago, Ill.
- Ryerson & Son, Inc., Jos. T., Chicago, Ill.
- Star Expansion Bolt Co., New York, N. Y.
- U. S. Expansion Bolt Co., York, Pa.

BOLTS AND STUDS, FLANGE

- Bethlehem Steel Co., Bethlehem, Pa.
- Black-Sivalls & Bryson, Inc., Kansas City, Mo.
- Chase Brass & Copper Co., Waterbury, Conn.
- Clark Bros. Bolt Co., Milldale, Conn.
- ● Crane Co., Chicago, Ill.
- Erie Bolt & Nut Co., Erie, Pa.
- Haskell Mfg. Co., Wm. H., Pawtucket, R. I.
- Lamson & Sessions Co., Cleveland, O.
- Maintenance Engineering Corp., Houston, Tex.
- Republic Steel Corp., Bolt & Nut Div., Cleveland, O.
- Rolyan Corp., Chicago, Ill.
- Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
- Ryerson & Son, Inc., Jos. T., Chicago, Ill.

BOLTS, TOGGLE AND ANCHOR

- Carty & Moore Engineering Co., Detroit, Mich.
- Chase Brass & Copper Co., Waterbury, Conn.
- Chicago Expansion Bolt Co., Chicago, Ill.
- Crawford Co., Chicago, Ill.
- Diamond Expansion Bolt Co., Inc., Garwood, N. J.
- Fee & Mason Mfg. Co., Inc., New York, N. Y.
- Grabler Mfg. Co., Cleveland, O.
- Paine Co., Chicago, Ill.
- Rawlplug Co., Inc., The, New York, N. Y.
- Republic Steel Corp., Bolt & Nut Div., Cleveland, O.
- Rolyan Corp., Chicago, Ill.
- Ryerson & Son., Inc., Jos. T., Chicago, Ill.
- Star Expansion Bolt Co., New York, N. Y.
- U. S. Expansion Bolt Co., York, Pa.

BOOTHS, PAINTING, SPRAY

- Aqua-Restor Div., Mayer Mfg. Corp., Brooklyn, N. Y.
- Belanger Fan & Blower Co., Detroit, Mich.
- Binks Mfg. Co., Chicago, Ill.
- DeVilbiss Co., The, Toledo, O.
- Goethel Sheet Metal Works, Alfred, Milwaukee, Wis.
- Grand Rapids Blow Pipe & Dust Arrester Co., Grand Rapids, Mich.
- Kirk & Blum Mfg. Co., Cincinnati, O.
- Mahon Co., R. C., Detroit, Mich.
- Peters-Dalton, Inc., Detroit, Mich.
- Schmieg Industries, Detroit, Mich.
- Spray Engineering Co., Somerville, Mass.
- Young & Bertke Co., Cincinnati, O.

BRAKES, SHEET METAL, HAND

- Dreis & Krump Mfg. Co., Chicago, Ill.
- Eiker Mfg. Co., Ogallala, Nebr.
- Excelsior Tool & Machine Co., East St. Louis, Ill.
- New Albany Machine Mfg. Co., New Albany, Ind.
- Niagara Machine & Tool Works, Buffalo, N. Y.
- ● O'Neil Irwin Mfg. Co., Minneapolis, Minn.
- Peck, Stow & Wilcox Co., Southington, Conn.
- Weiss & Co., H., New York, N. Y.
- Whitney Metal Tool Co., Rockford, Ill.

BRAKES, SHEET METAL, PORTABLE

- Dreis & Krump Mfg. Co., Chicago, Ill.
- Eiker Mfg. Co., Ogallala, Nebr.
- ● O'Neil Irwin Mfg. Co., Minneapolis, Minn.
- Whitney Metal Tool Co., Rockford, Ill.

BRAKES, SHEET METAL, POWER

- Cincinnati Shaper Co., Cincinnati, O.
- Dreis & Krump Mfg. Co., Chicago, Ill.
- Heartley Machine & Tool Co., Toledo, O.
- Ohl & Co., Geo. A., Newark, N. J.
- Peck, Stow & Wilcox Co., Southington, Conn.
- Rafter Machine Co., Belleville, N. J.
- Swaine Mfg. Co., Fred J., St. Louis, Mo.
- Verson Allsteel Press Co., Chicago, Ill.
- Weiss & Co., H., New York, N. Y.
- Whitney Metal Tool Co., Rockford, Ill.

BRASS PIPE

See Pipe, Brass and Copper

BRASS TUBING

See Tubing, Brass and Copper

BRASS UNIONS

See Unions, Brass

BRASS VALVES

See Valves, Gate; and Valves, Globe

BRAZING TORCHES

See Torches, Brazing

BRONZE VALVES

See Valves, Gate; and Valves, Globe

BUILDING INSULATION

See Insulation, Building

BURNERS, GAS, COMMERCIAL AND INDUSTRIAL

- Barber Gas Burner Co., Cleveland, O.
- Beck Engineering Combustion Kompany, St. Louis, Mo.
- ● Bryant Heater Co., The, Cleveland, O.
- Campbell Heating Co., E. K., Kansas City, Mo.
- Conco Corp., Div. of H. D. Conkey & Co., Mendota, Ill.
- Continental Stove Corp., Ironton, O.
- Coppus Engineering Corp., Worcester, Mass.
- Eclipse Fuel Engrg. Co., Rockford, Ill.
- Engineer Co., New York, N. Y.
- Enterprise Engine & Foundry Co., San Francisco, Calif.
- Grand Rapids Blow Pipe & Dust Arrester Co., Grand Rapids, Mich.
- Hugo Mfg. Co., West Duluth, Minn.
- Jamieson Mfg. Co., Dallas, Tex.
- Johnson Gas Appliance Co., Cedar Rapids, Ia.
- Lammert & Mann Co., Chicago, Ill.
- Martin, J. O. & C. U., San Francisco, Calif.
- Mears-Kane-Ofeldt, Inc., Philadelphia, Pa.
- ● Mettler Co., Lee B., Los Angeles, Calif.
- National Airoil Burner Co., Inc., Philadelphia, Pa.
- National Machine Wks., Chicago, Ill.
- North American Mfg. Co., Cleveland, O.
- Payne Furnace & Supply Co., Inc., Beverly Hills, Calif.
- Peabody Engrg. Corp., New York, N. Y.
- ● R-S Products Corp., Philadelphia, Pa.
- Ray Oil Burner Co., San Francisco, Calif.
- ● Reznor Mfg. Co., Mercer, Pa.
- Roberts-Gordon Appliance Corp., Buffalo, N. Y.
- Ross Engineering Corp., J. O., New York, N. Y.
- Rotary Mfg. Co., Los Angeles, Calif.
- Schutte & Koerting Co., Philadelphia, Pa.
- Selas Co., The, Philadelphia, Pa.
- Sellers Engineering Co., Chicago, Ill.
- Sonner Burner Co., Winfield, Kans.
- Staples & Pfeiffer, Ltd., San Francisco, Calif.
- Sullivan Valve & Engineering Co., Butte, Mont.
- Surface Combustion, Toledo, O.
- ● Todd Combustion Equipment, Inc., New York, N. Y.
- ● Webster Engineering Co., Tulsa, Okla.
- Williams, Inc., F. C., Dearborn, Mich.
- ● Zink Co., John, Tulsa, Okla.

BURNERS, GAS AND OIL COMBINED, COMMERCIAL AND INDUSTRIAL

- Babcock & Wilcox Co., New York, N. Y.
- Coppus Engineering Corp., Worcester, Mass.
- Engineer Co., New York, N. Y.
- Enterprise Engine & Foundry Co., San Francisco, Calif.
- Johnson Co., S. T., Oakland, Calif.
- ● Mettler Co., Lee B., Los Angeles, Calif.
- National Airoil Burner Co., Inc., Philadelphia, Pa.
- Peabody Engineering Corp., New York, N. Y.
- ● R-S Products Corp., Philadelphia, Pa.

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Ray Oil Burner Co., San Francisco, Calif.
Ross Engineering Corp., J. O., New York, N. Y.
Sellers Engineering Co., Chicago, Ill.
Staples & Pfeiffer, Ltd., San Francisco, Calif.
Surface Combustion, Toledo, O.
Thermal Engineering Co., Chicago, Ill.
● Todd Combustion Equipment, Inc., New York, N. Y.
● Webster Engineering Co., Tulsa, Okla.
● Zink Co., John, Tulsa, Okla.

BURNERS, OIL, COMMERCIAL AND INDUSTRIAL

● Airtemp, Div. of Chrysler Corp., Dayton, O.
Babcock & Wilcox Co., New York, N. Y.
Bethlehem Foundry & Machine Co., Bethlehem, Pa.
Caloroil Burner Corp., Hartford, Conn.
Century Engrg. Corp., Cedar Rapids, Ia.
Chandler Co., Cedar Rapids, Ia.
Chisholm Co., Allen E., Portland, Ore.
Combustion Engineering Co., Inc., New York, N. Y.
Conco Corp., Div. of H. D. Conkey & Co., Mendota, Ill.
Eastern Oil & Equipment Co., Inc., Portland, Me.
Electrol Mfg. Co., Passaic, N. J.
Engineering Co., New York, N. Y.
Enterprise Engine & Foundry Co., San Francisco, Calif.
Hardinge Mfg. & Oil Burner Co., Chicago, Ill.
Harvey-Whipple, Inc., Springfield, Mass.
Holtum Mfg. Co., Freeport, Ill.
Johnson Co., S. T., Oakland, Calif.
Johnson Mfg. Co., Waterloo, Ia.
Kisco Boiler & Engineering Co., St. Louis, Mo.
Kleen-Heet, Inc., Chicago, Ill.
Lammert & Mann Co., Chicago, Ill.
Littleford Bros., Cincinnati, O.
● May Oil Burner Corp., Baltimore, Md.
● Mettler Co., Lee B., Los Angeles, Calif.
Montag Stove & Furnace Works, Portland, Ore.
National Airoil Burner Co., Inc., Philadelphia, Pa.
North American Mfg. Co., Cleveland, O.
Nu-Way Corp., Rock Island, Ill.
Pan-American Engineering Co., Berkeley, Calif.
Peabody Engrg. Corp., New York, N. Y.
● Petroleum Heat & Power Co., Stamford, Conn.
Preferred Utilities Co., Inc., New York, N. Y.
Quiet Heet Mfg. Co., Newark, N. J.
● R-S Products Corp., Philadelphia, Pa.
Ray Oil Burner Co., San Francisco, Calif.
Reif-Rexoil, Inc., Buffalo, N. Y.
Riley Stoker Corp., Worcester, Mass.
Ross Engineering Corp., J. O., New York, N. Y.
Rotary Mfg. Co., Los Angeles, Calif.
Schutte & Koerting Co., Philadelphia, Pa.
Scott-Newcomb, Inc., St. Louis, Mo.
Simplex Oil Heating Corp., Newark, N. J.
Staples & Pfeiffer, Ltd., San Francisco, Calif.
Thermal Engineering Co., Chicago, Ill.
● Todd Combustion Equipment, Inc., Brooklyn, N. Y.
Vortex Mfg. Co., Portland, Ore.
Wayne Oil Burner Co., Fort Wayne, Ind.
● Webster Engineering Co., Tulsa, Okla.
Williams, Inc., F. C., Dearborn, Mich.
Williams Oil-O-Matic Heating Corp., Bloomington, Ill.
York-Heat Div., York-Shipley, Inc., York, Pa.
● Zink Co., John, Tulsa, Okla.

CARBON DIOXIDE ANALYZERS

See Analyzers, Carbon Dioxide, Portable

CARBON DIOXIDE INDICATORS

See Indicators, Carbon Dioxide, Boiler Room

CARBON PIPE, TUBING, FITTINGS AND VALVES

See Pipe, Tubing, Fittings and Valves, Carbon

CAST IRON PIPE

See Pipe, Cast Iron

CEMENT AND COMPOUNDS, PIPE JOINT

Acme Refining Co., The, Cleveland, O.
Acorn Refining Co., Cleveland, O.
Akron Metallic Gasket Co., Akron, O.
Atlas Chemical Co., Marietta, O.
Babbitt Industrial Specialties Co., New York, N. Y.
Baer Bros., New York, N. Y.
Barber Asphalt Corp., Barber, N. J.
Barrett Div., The, Allied Chemical & Dye Corp., New York, N. Y.
Black Magic Products Co., Tulsa, Okla.
Blue Seal Chemical Co., Roselle Park, N. J.
Burnley Battery & Mfg. Co., North East, Pa.
Calbar Paint & Varnish Co., Philadelphia, Pa.
Clinton Metallic Paint Co., Clinton, N. Y.
Colebrook & Sons, Inc., W. H., Syracuse, N. Y.
Continental Products Co., Euclid, O.
Cooper Sanitary Co., Philadelphia, Pa.
● Crane Co., Chicago, Ill.
Crane Packing Co., Chicago, Ill.
Croll & Son, Jesse G., Philadelphia, Pa.
Detroit Graphite Co., Detroit, Mich.
Dixon Crucible Co., Joseph, Jersey City, N. J.
Goetze Gasket & Packing Co., Inc., New Brunswick, N.
Greene, Tweed & Co., New York, N. Y.
● Grinnell Co., Inc., Providence, R. I.
Hercules Chemical Co., Inc., New York, N. Y.
Hetzel Roofing Products Co., Newark, N. J.
Horn Co., A. C., Long Island City, N. Y.
Key Co., East St. Louis, Ill.
Keystone Asphalt Products Co., Chicago, Ill.
Krehbiel Co., J. H., Chicago, Ill.
Mackson's Co., New York, N. Y.
Metropolitan Refining Co., Inc., Long Island City, N. Y
Montgomery Bros., San Francisco, Calif.
National Engineering Products, Inc., Washington, D. C.
Nebel Mfg. Co., Cleveland, O.
Pennsylvania Salt Mfg. Co, Philadelphia, Pa.
Permatex Co., Inc., Sheepshead Bay, N. Y.
Preferred Utilities Co., Inc., New York, N. Y.
Pyrolite Products Co., Cleveland, O.
Radiator Specialty Co., Charlotte, N. C.
Reilly Tar & Chemical Corp., Indianapolis, Ind.
Rockwood Sprinkler Co., Worcester, Mass.
● Rutland Fire Clay Co., Rutland, Vt.
Sauereisen Cements Co., Pittsburgh, Pa.
Schundler & Co., F. E., Long Island City, N. Y.
Smooth-On Mfg. Co., Jersey City, N. J.
Star Products Co., New York, N. Y.
Thompson & Co., Pittsburgh, Pa.
United States Stoneware Co., New York, N. Y.
Utility Laboratory, Inc., Brooklyn, N. Y.
Wilhelm Co., A., Reading, Pa.
● X Laboratories, Inc., New York, N. Y.
X-Pando Corp., Long Island City, N. Y.

CEMENT, FURNACE

Acme Asbestos Covering & Flooring Co., Chicago, Ill.
Armstrong Co., Detroit, Mich.
Botfield Refractories Co., Philadelphia, Pa.
Buckeye Products Co., Cincinnati, O.
● Carey Mfg. Co., Philip, Lockland, Cincinnati, O.
Chicago Fire Brick Co., Chicago, Ill.
Clinton Metallic Paint Co., Clinton, N. Y. (Asbestos)
Colebrook & Sons, Inc., W. H., Syracuse, N. Y.
Continental Products Co., Euclid, O.
Ehret Magnesia Mfg. Co., Valley Forge, Pa.
Fireline Stove & Furnace Lining Co., Chicago, Ill.
Glidden Co., Cleveland, O.
● Grant Wilson, Inc., Chicago, Ill. (Asbestos)
Green Fire Brick Co., A. P., Mexico, Mo.
Hercules Chemical Co., Inc., New York, N. Y.
Hetzel Roofing Products Co., Newark, N. J.
Johns-Manville, New York, N. Y.
Keasbey Co., Robert A., New York, N. Y. (Asbestos)
Klee Co., Geo. B., Cincinnati, O.
Krehbiel Co., J. H., Chicago, Ill.
Laclede-Christy Clay Products Co., St. Louis, Mo.
Lastik Products Co., Inc., Pittsburgh, Pa.
McLeod & Henry Co., Inc., Troy, N. Y.
Munn and Steel, Inc., Newark, N. J.
Nebel Mfg. Co., Cleveland, O.
Pecora Paint Co., Philadelphia, Pa.
Plastic Products Co., Detroit, Mich.
Preferred Utilities Co., Inc., New York, N. Y.
Presstite Engineering Co., St. Louis, Mo.
Pyrolite Products Co., Cleveland, O.
Quigley Co., Inc., New York, N. Y.
Refractory & Insulation Corp., New York, N. Y.
Robinson Insulation Co., Great Falls, Mont.
Ruberoid Co., New York, N. Y.
● Rutland Fire Clay Co., Rutland, Vt.
● Sall Mountain Co., Chicago, Ill.
Sauereisen Cements Co., Pittsburgh, Pa.
Standard Asbestos Mfg. Co., Chicago, Ill.
Standard Fuel Engineering Co., Detroit, Mich.
Tamms Silica Co., Chicago, Ill.
United States Stoneware Co., New York, N. Y.
Walsh Refractories Corp., St. Louis, Mo.
Wilhelm Co., A., Reading, Pa.
● Wilson, Grant, Inc., Chicago, Ill. (Asbestos)

CEMENT, INSULATING

Acme Asbestos Covering & Flooring Co., Chicago, Ill.
Baldwin-Hill Co., Trenton, N. J. (Rock wool)
Barrett Div., The, Allied Chemical & Dye Corp., New York, N. Y.
Bird-Archer Co., Philadelphia, Pa.
Botfield Refractories Co., Philadelphia, Pa.
● Carey Mfg. Co., Philip, Lockland, Cincinnati, O.
Carney Rockwool Co., Mankato, Minn.
Chicago Fire Brick Co., Chicago, Ill.
Clinton Metallic Paint Co., Clinton, N. Y.
Colebrook & Sons, Inc., W. H., Syracuse, N. Y.
Eagle-Picher Lead Co., Cincinnati, O.
Ehret Magnesia Mfg. Co., Valley Forge, Pa.
● Grant Wilson, Inc., Chicago, Ill.
Green Fire Brick Co., A. P., Mexico, Mo.
Industrial Research, Lansdowne, Pa.
International Vermiculite Co., Springfield, Ill.

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Johns-Manville, New York, N. Y.
Keasbey Co., Robert A., New York, N. Y.
Keasbey & Mattison Co., Ambler, Pa.
Krehbiel Co., J. H., Chicago, Ill. (Asbestos, mineral wool)
McLeod & Henry Co., Inc., Troy, N. Y.
Mitchell & Smith, Inc., Detroit, Mich.
Munn and Steele, Inc., Newark, N. J.
National Engineering Products, Inc., Washington, D. C.
National Gypsum Co., Buffalo, N. Y.
Nelson Mfg. Co., B. F., Minneapolis, Minn.
Norristown Magnesia & Asbestos Co., Norristown, Pa.
Ohmlac Paint & Refining Co., Chicago, Ill.
● Owens-Corning Fiberglas Corp., Toledo, O.
Plant Rubber & Asbestos Works, San Francisco, Calif.
Plibrico Jointless Firebrick Co., Chicago, Ill.
Poe Co., C. W., Cleveland, O.
Preferred Utilities Co., Inc., New York, N. Y.
Pyrolite Products Co., Cleveland, O.
Quigley Co., Inc., New York, N. Y.
Ramtite Co., The, Chicago, Ill.
Refractory & Insulation Corp., New York, N. Y.
Rex Clay Products Co., Detroit, Mich.
Robinson Insulation Co., Great Falls, Mont.
Ruberoid Co., New York, N. Y.
● Rutland Fire Clay Co., Rutland, Vt.
● Sall Mountain Co., Chicago, Ill.
Sauereisen Cements Co., Pittsburgh, Pa. (Electrical)
Schundler & Co., Inc., F. E., Long Island City, N. Y.
Smith & Kanzler Corp., Elizabeth, N. J.
Standard Asbestos Mfg. Co., Chicago, Ill.
Standard Fuel Engineering Co., Detroit, Mich.
Tennessee Products Corp., Nashville, Tenn.
Therminsul Corp., Kalamazoo, Mich.
Thompson & Co., Pittsburgh, Pa.
United States Mineral Wool Co., Chicago, Ill.
Universal Zonolite Insulation Co., Chicago, Ill.
● Wilson, Inc., Grant, Chicago, Ill.

CENTRIFUGAL PUMPS

See Pumps, Centrifugal

CHAIN DRIVES

See Drives, Chain

CHANGERS, SPEED, HYDRAULIC COUPLING

American Blower Corp., Detroit, Mich.
Electric Machinery Mfg. Co., Minneapolis, Minn. (Magnetic variable speed drive)
● United States Air Conditioning Corp., Minneapolis, Minn.

CHANGERS, SPEED, MECHANICAL

● Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American Pulley Co., Philadelphia, Pa.
Browning Mfg. Co., Inc., Maysville, Ky.
Chicago Die Casting Mfg. Co., Chicago, Ill.
Dodge Mfg. Corp., Mishawaka, Ind.
Graham Transmissions, Inc., Milwaukee, Wis.
Ideal Commutator Dresser Co., Sycamore, Ill.
Lewellen Mfg. Co., Columbus, Ind.
● Link-Belt Co., Philadelphia, Pa.
Reeves Pulley Co., Columbus, Ind.
Speedmaster Co., The, Des Plaines, Ill.
Standard Transmission Equipment Co., Los Angeles, Calif.
● Stephens-Adamson Mfg. Co., Aurora, Ill.
White Mfg. Co., St. Paul, Minn.

CHECK VALVES

See Valves, Check

CHILLERS, WATER, FOR AIR CONDITIONING AND REFRIGERATION

Acme Industries, Inc., Jackson, Mich.
● Baker Ice Machine Co., Inc., Omaha, Neb.
Croll-Reynolds Engineering Co., Inc., New York, N. Y.
● Curtis Refrigerating Machine Co., St. Louis, Mo.
Downingtown Iron Works, Downingtown, Pa.
Drayer & Hanson, Inc., Los Angeles, Calif.
● Filtrine Mfg. Co., Brooklyn, N. Y.
Frick Co., Waynesboro, Pa.
General Electric Co., Air Conditioning and Commercial Refrigeration Divisions, Bloomfield, N. J.
General Refrigeration Div., Yates-American Machine Co., Beloit, Wis.
Griscom-Russell Co., The, New York, N. Y.
Heat Transfer Products, Inc., New York, N. Y.
Howe Ice Machine Co., Chicago, Ill.
McQuay, Inc., Minneapolis, Minn.
Mojonnier Bros. Co., Chicago, Ill.
Niagara Blower Co., New York, N. Y.
● Patterson-Kelley Co., Inc., East Stroudsburg, Pa.
Phillips Cooling Tower Co., Inc., New York, N. Y.
Refrigeration Economics Co., Inc., Canton, O.
Richmond Engineering Co., Inc., Richmond, Va.
Ross Heater & Mfg. Co., Inc., Buffalo, N. Y.
Temprite Products Corp., Detroit, Mich.
● Trane Co., The, La Crosse, Wis.
Vilter Mfg. Co., Milwaukee, Wis.
Westinghouse Electric & Mfg. Co., Springfield, Mass.
● Whitlock Mfg. Co., Hartford, Conn.
● Worthington Pump & Machinery Corp., Air Conditioning & Refrigeration Div., Harrison, N. J.
XL Refrigerating Co., Chicago, Ill.
York Corp., York, Pa.

CIRCULATORS FOR HOT WATER HEATING SYSTEMS

American-Marsh Pumps, Inc., Battle Creek, Mich.
● Bell & Gossett Co., Morton Grove, Ill.
Columbus Steam Pump Works Co., Columbus, O.
Everite Pump & Mfg. Co., Inc., Lancaster, Pa.
● Hoffman Specialty Co., Indianapolis, Ind.
● Hotstream Heater Co., Cleveland, O.
Kainer & Co., Chicago, Ill.
Kehm Corp., The, Chicago, Ill.
● Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
Mojonnier Brothers Co., Chicago, Ill.
Penberthy Injector Co., Detroit, Mich.
Taco Heaters, Inc., New York, N. Y.
● Thrush & Co., H. A., Peru, Ind.
● Trane Co., The, La Crosse, Wis.
Triplex Heating Specialty Co., Peru, Ind.
White Flo-Matic Corp., Hoosick Falls, N. Y.

CLAMPS, BEAM, PIPE HANGING

Acme Tin Plate & Roofing Supply Co., Philadelphia, Pa.
Carpenter & Paterson, Inc., East Boston, Mass.
Chicago Nipple Mfg. Co., Chicago, Ill.
● Crane Co., Chicago, Ill.
Crawford Co., Chicago, Ill.
Diamond Expansion Bolt Co., Inc., Garwood, N. J.
Farley Sleeve & Hanger Co., Cleveland, O.
Fee & Mason Mfg. Co., Inc., New York, N. Y.
● Flori Pipe Co., The, St. Louis, Mo.
Frick Co., Waynesboro, Pa.
Globe Machine & Stamping Co., Cleveland, O.
Grabler Mfg. Co., Cleveland, O.
● Grinnell Co., Inc., Providence, R. I.
Jarecki Mfg. Co., Erie, Pa.
National Valve & Mfg. Co., Pittsburgh, Pa.
Paine Co., Chicago, Ill.
● Walworth Co., New York, N. Y.

CLAMPS, PIPE REPAIR

Alten's Foundry & Machine Works, Lancaster, O.
Chelsea Metal Stamping Co., New York, N. Y.
Dresser Mfg. Co., Bradford, Pa.
Inner-Tite Clamp Corp., Elizabeth, N. J.
Jarecki Mfg. Co., Erie, Pa.
Skinner Co., M. B., South Bend, Ind.
Smooth-On Mfg. Co., Jersey City, N. J.
● Yarnall-Waring Co., Philadelphia, Pa.

CLAMPS, PIPE, WELDING

● Detroit Stamping Co., Detroit, Mich.
Hercules Electric & Mfg. Co., Inc., Brooklyn, N. Y.
● Jewel Mfg. Co., St. Paul, Minn.

CLEANERS, AIR, ELECTRICAL

● American Air Filter Co., Inc., Louisville, Ky.
● Westinghouse Electric & Mfg. Co., Cleveland, O.

CLEANERS, TUBE

Albright Equipment Co., Johnstown, Pa.
Armstrong Mfg. Co., Bridgeport, Conn.
Elliott Co., Jeannette, Pa.
Huyette Co., Inc., Paul B., Philadelphia, Pa.
Mall Tool Co., Chicago, Ill.
Perfection Grate & Stoker Co., Springfield, Mass.
Pierce Co., Wm. B., The, Buffalo, N. Y.
Pilley Brush Co., Fort Madison, Ia.
Rosedale Foundry & Machine Co., Pittsburgh, Pa.
Spencer Turbine Co., Hartford, Conn.
Stow Mfg. Co., Binghampton, N. Y.
Wallace & Tiernan Co., Inc., Newark, N. J. (for slime and scale)

CLEANING COMPOUNDS

See Compounds, Cleaning, Pipe Coil and Condenser

COAL CONVEYORS

See Conveyors, Coal and Ash

COATINGS, PROTECTIVE, FOR METALS

Airose Chemical Co., Providence, R. I.
American Solder & Flux Co., Philadelphia, Pa. (Galvanizing powder)
Barrett Div., The, Allied Chemical & Dye Corp., New York, N. Y
Dampney Co. of America, Boston, Mass.
Dearborn Chemical Co., Chicago, Ill. (rust preventive)
Debevoise Co., The, Brooklyn, N. Y. (cement)
Flintkote Co., The, New York, N. Y. (Asphalt emulsions)
Haering Co., Inc., D. W., Chicago, Ill. (drying and non-drying)
Johnson Co., Lloyd S., Chicago, Ill.
Laclede-Christy Clay Products Co., St. Louis, Mo. (high temperature paint)

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• Mortell Co., J. W., Kankakee, Ill. (asphalt)
Nebel Mfg. Co., Cleveland, O.
Nelson Mfg. Co., B. F., Minneapolis, Minn.
Ohmlac Paint & Refining Co., Chicago, Ill. (acid resistant, heat resistant)
Pennsylvania Salt Mfg. Co., Philadelphia, Pa.
Pittsburgh Plate Glass Co., Pittsburgh, Pa.
Pyrolite Products Co., Cleveland, O.
Quigley Co., Inc., New York, N. Y.
Reilly Tar & Chemical Corp., Indianapolis, Ind. (coal tar base)
• Ric-wiL Co., Cleveland, O.
Saverite Engineering Co., Hoboken, N. J.
Sonneborn Sons, Inc., L., New York, N. Y.
Turco Products, Inc., Los Angeles, Calif.
United Chromium, Inc., New York, N. Y.
United States Stoneware Co., New York, N. Y. (Corrosion resistant)
Vesco Corp., New York, N. Y.
Wailes Dove-Hermiston Corp., Westfield, N. J. (coal tar industrial pigmented)
Wipe-On Corp., New York, N. Y.
Wolfe-Kote Co., Sheboygan, Wis.
X-Pando Corp., Long Island City, N. Y.

COCKS, BOILER GAGE

American Injector Co., Detroit, Mich.
Bordo Co., Inc., L. J., Glenside, Pa.
• Crane Co., Chicago, Ill.
Hanlon-Waters, Inc., Tulsa, Okla.
Keckley Co., O. C., Chicago, Ill.
Lunkenheimer Co., Cincinnati, O.
Williams Gauge Co., Pittsburgh, Pa.
Wright-Austin Co., Detroit, Mich.

COILS

See Surface, Cooling; Surface, Heating

COILS, FOR HOT WATER STORAGE TANKS

• American District Steam Co., North Tonawanda, N. Y.
• Bell & Gossett Co., Morton Grove, Ill.
Kopperman & Sons, Joseph, Philadelphia, Pa.
National Pipe Bending Co., New Haven, Conn.
• Patterson-Kelley Co., Inc., East Stroudsburg, Pa.
Roessing Mfg. Co., Pittsburgh, Pa.
Sales & Co., Murray W., Detroit, Mich.
Sims Co., Erie, Pa.
Standard Heater & Oil Equipment Co., Jersey City, N. J.
Taco Heaters, Inc., New York, N. Y.

COILS, PIPE

Acme Industries, Inc., Jackson, Mich.
• American Smelting & Refining Co., New York, N. Y.
• Baker Ice Machine Co., Inc., Omaha, Nebr.
Chicago Nipple Mfg. Co., Chicago, Ill.
• Crane Co., Chicago, Ill.
Downingtown Iron Works, Downingtown, Pa.
• Ellsworth Pipe & Supply Co., Milwaukee, Wis.
Frick Co., Waynesboro, Pa.
Harris & Co., Arthur, Chicago, Ill.
Kopperman & Sons, Joseph, Philadelphia, Pa.
Limbert & Co., Geo. B., Chicago, Ill.
• Marlo Coil Co., St. Louis, Mo.
• Midwest Piping & Supply Co., Inc., St. Louis, Mo.
Mueller Brass Co., Port Huron, Mich.
National Pipe Bending Co., New Haven, Conn.
Ohio Pipe Bending & Machine Co., Cleveland, O.
Philadelphia Pipe Bending Co., Philadelphia, Pa.
Rempe Co., Chicago, Ill.
Roessing Mfg. Co., Pittsburgh, Pa.
Sales & Co., Murray W., Detroit, Mich.
Semet-Solvay Engineering Corp., New York, N. Y.
Standard Heater & Oil Equipment Co., Jersey City, N. J.
Vilter Mfg. Co., Milwaukee, Wis.
Vogt Machine Co., Henry, Louisville, Ky.

COLLECTORS, DUST

Aget-Detroit Co., Ann Arbor, Mich.
Allen Billmyre Co., Mamaroneck, N. Y.
Allington & Curtis Mfg. Co., Saginaw, Mich.
• American Air Filter Co., Louisville, Ky.
American Blower Corp., Detroit, Mich.
American Foundry Equipment Co., Mishawaka, Ind.
American Metal Products Co., Fort Worth, Tex.
Aqua-Restor Div., Mayer Mfg. Corp., Brooklyn, N. Y.
Bargar Sheet Metal Co., Cleveland, O.
Bayley Blower Co., Milwaukee, Wis.
Blower Application Co., Milwaukee, Wis.
Bubar, Hudson H., New York, N. Y.
• Buffalo Forge Co., Buffalo, N. Y.
Buffalo Tank Corp., Dunellen, N. J.
Centri-Spray Co., Detroit, Mich.
Clark Dust Control Co., Chicago, Ill.
Day Co., The, Minneapolis, Minn.
Diamond Power Specialty Corp., Detroit, Mich.
Dracco Corp., Cleveland, O.
Garden City Fan Co., Chicago, Ill.
Goethel Sheet Metal Wks., Alfred, Milwaukee, Wis.
Grand Rapids Blow Pipe & Dust Arrester Co., Grand Rapids, Mich.
Jacobs Co., B. & J., Cincinnati, O.
Kirk & Blum Mfg. Co., Cincinnati, O.
Kluegel & Co., E., St. Paul, Minn.
Knickerbocker Co., Jackson, Mich.
Kopperman & Sons, Joseph, Philadelphia, Pa.
Lehigh Fan & Blower Co., Allentown, Pa.
Lumm Co., A. H., Toledo, O.
National Radiator Co., The, Johnstown, Pa.
New York Blower Co., Chicago, Ill.
Northern Blower Co., Cleveland, O.
Pangborn Corp., Hagerstown, Md.
Peters-Dalton, Inc., Detroit, Mich.
Prat-Daniel Corp., Port Chester, N. Y.
Puhl & Hepper Mfg. Co., Inc., St. Louis, Mo.
Research Corp., New York, N. Y.
• Ruemelin Mfg. Co., Milwaukee, Wis.
Schmieg Industries, Detroit, Mich.
Schneible Co., Claude B., Detroit, Mich.
• Skinner Heating & Ventilating Co., Inc., Div. of St. Louis Blow Pipe & Heater Co., St. Louis, Mo.
Sly Mfg. Co., W. W., Cleveland, O.
Spencer Turbine Co., Hartford, Conn.
Steinhorst & Sons, Inc., Emil, Utica, N. Y.
Strandwitz & Co., Inc., W. J., Camden, N. J.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Torit Mfg. Co., St. Paul, Minn.
Western Blower Co., Seattle, Wash.
Western Precipitation Corp., Los Angeles, Calif.
Whiting Corp., Harvey, Ill.
Winkler & Sons, Inc., A. E., Milwaukee, Wis.
Young & Bertke Co., Cincinnati, O.

COMBUSTION CONTROL

See Controls, Draft, Barometric; Regulators, Draft, Combustion; Systems, Combustion Control

COMBUSTION RECORDERS

See Recorders, Carbon Dioxide

COMPOUNDS, BOILER CLEANING

Acme Refining Co., The, Cleveland, O.
American K. A. T. Corp., New York, N. Y.
American Teksag Products, Inc., Mount Vernon, N. Y.
• Anderson-Stolz Corp., Kansas City, Mo.
Aquatic Chemical Laboratories, Inc., New York, N. Y.
Blue Seal Chemical Co., Roselle Park, N. J.
Brown-Ford Corp., Newton, Mass.
Cannon Chemical Co., Everett, Mass.
Chicago Specialty Mfg. Co., Chicago, Ill.
Continental Products Co., Euclid, O.
Dearborn Chemical Co., Chicago, Ill.
Diamond Chemical Products, New York, N. Y.
Ferro-Nil Corp., New York, N. Y.
Grief, Edward C., Bogota, N. J.
Hagan Corp., Pittsburgh, Pa.
Haering & Co., Inc., D. W., Chicago, Ill.
Hercules Chemical Co., Inc., New York, N. Y.
Kisco Boiler & Engineering Co., St. Louis, Mo.
Krehbiel Co., J. H., Chicago, Ill.
Metropolitan Refining Co., Inc., Long Island City, N. Y.
National Aluminate Corp., Chicago, Ill.
North American Fibre Products Co., The, Cleveland, O.
Radiator Specialty Co., Charlotte, N. C.
Utility Laboratory, Inc., Brooklyn, N. Y.
Vinco Co., Inc., The, New York, N. Y.
Water Service Laboratories, Inc., New York, N. Y.
Western Chemical Co., Kansas City, Mo.
• X Laboratories, Inc., New York, N. Y.

COMPOUNDS, BOILER AND RADIATOR SEALING

Atlas Chemical Co., Marietta, O.
Blue Seal Chemical Co., Roselle Park, N. J.
Cannon Chemical Co., Everett, Mass.
Chicago Specialty Mfg. Co., Chicago, Ill.
Cooper Sanitary Co., Philadelphia, Pa.
Dearborn Chemical Co., Chicago, Ill.
Desolvo Co., The, Pittsburgh, Pa.
Halowax Products Div., Union Carbide & Carbon Corp., New York, N. Y.
Hampton-Cross Co., The, Louisville, Ky.
Hercules Chemical Co., Inc., New York, N. Y.
Krehbiel Co., J. H., Chicago, Ill.
Metropolitan Refining Co., Inc., Long Island City, N. Y.
National Engineering Products, Inc., Washington, D. C.
Permatex Co., Inc., Sheepshead Bay, N. Y.
Radiator Specialty Co., Charlotte, N. C.
Star Products Co., New York, N. Y.
Vinco Co., Inc., The, New York, N. Y.
• X Laboratories, Inc., New York, N. Y.

COMPOUNDS, CAULKING

Accurate Metal Weather Strip Co., New York, N. Y.
Acme Refining Co., The, Cleveland, O.
Acme White Lead & Color Works, Detroit, Mich.
Acorn Refining Co., Cleveland, O.
All Metal Weatherstrip Co., Chicago, Ill.
Alpha Metal & Rolling Mills, Inc., Brooklyn, N. Y.
American Metal Weather Strip Co., Grand Rapids, Mich.

• Advertisement in this issue. See Index to Advertisers, page 322.

Armstrong Co., The, Detroit, Mich.
Asphalt Products Co., Syracuse, N. Y.
Babbitt Industrial Specialties Co., New York, N. Y.
Barber Asphalt Corp., Barber, N. J.
Barland Weatherstrip Material Co., Cleveland, O.
Calbar Paint & Varnish Co., Philadelphia, Pa.
● Carey Mfg. Co., Philip, Cincinnati, O.
Chamberlin Metal Weather Strip Co., Detroit, Mich.
Clinton Metallic Paint Co., Clinton, N. Y.
Continental Products Co., Euclid, O.
Flintkote Co., The, New York, N. Y.
Ford Roofing Products Co., Chicago, Ill.
Glidden Co., Cleveland, O.
Hetzel Roofing Products Co., Newark, N. J.
Horn Co., A. C., Long Island City, N. Y.
Iowa Paint Mfg. Co., Des Moines, Ia.
Johns-Manville, New York, N. Y.
Krehbiel Co., J. H., Chicago, Ill.
Lastik Products Co., Inc., Pittsburgh, Pa.
Lehon Co., Chicago, Ill.
Maas & Waldstein Co., Newark, N. J.
Metropolitan Refining Co., Inc., Long Island City, N. Y.
● Mortell Co., J. W., Kankakee, Ill.
National Mfg. Corp., Tonawanda, N. Y.
Nebel Mfg. Co., Cleveland, O.
North American Fibre Products Co., The, Cleveland, O.
Ohmlac Paint & Refining Co., Chicago, Ill.
Pecora Paint Co., Philadelphia, Pa.
Pittsburgh Plate Glass Co., Pittsburgh, Pa.
Plastic Products Co., Detroit, Mich.
Presstite Engineering Co., St. Louis, Mo.
Pyrolite Products Co., Cleveland, O.
Quigley Co., Inc., New York, N. Y.
Radiator Specialty Co., Charlotte, N. C.
Reilly Tar & Chemical Corp., Indianapolis, Ind.
Sherwin-Williams Co., The, Cleveland, O.
Sipe & Co., James B., Pittsburgh, Pa.
Smooth-On Mfg. Co., Jersey City, N. J.
Sonneborn Sons, Inc., L., New York, N. Y.
Tamms Silica Co., Chicago, Ill.
Thompson & Co., Pittsburgh, Pa.
Tropical Paint & Oil Co., Cleveland, O.
United States Stoneware Co., New York, N. Y.
Wilhelm Co., A., Reading, Pa.
X-Pando Corp., Long Island City, N. Y.
Yardley Screen & Weather Strip Corp., Columbus, O.

COMPOUNDS, CLEANING, PIPE COIL AND CONDENSER

● Anderson-Stolz Corp., Kansas City, Mo.
Aquatic Chemical Laboratories, Inc., New York, N. Y.
Blue Seal Chemical Co., Roselle Park, N. J.
Cannon Chemical Co., Everett, Mass.
Dearborn Chemical Co., Chicago, Ill.
Forslund Pump & Machinery Co., Kansas City, Mo.
Haering Co., Inc., D. W., Chicago, Ill.
Hercules Chemical Co., Inc., New York, N. Y.
National Airoil Burner Co., Inc., Philadelphia, Pa.
North American Fibre Products Co., The, Cleveland, O.
Oakite Products, Inc., New York, N. Y.
Radiator Specialty Co., Charlotte, N. C.
Turco Products, Inc., Los Angeles, Calif.
Utility Laboratory, Inc., Brooklyn, N. Y.
Western Chemical Co., Kansas City, Mo.

COMPOUNDS, WELDING

American Solder & Flux Co., Philadelphia, Pa.
Midland Paint & Varnish Co., Cleveland, O.
Turco Products, Inc., Los Angeles, Calif.

COMPRESSION PIPE FITTINGS

See Fittings, Pipe, Compression

COMPRESSOR BASES

See Bases and Pads, Vibration Isolating

COMPRESSOR VALVES

See Valves, Compressor

COMPRESSORS, AIR

Allen Billmyre Co., Mamaroneck, N. Y.
● Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American-Marsh Pumps, Inc., Battle Creek, Mich.
Beach-Russ Co., New York, N. Y.
Binks Mfg. Co., Chicago, Ill.
Brunner Mfg. Co., Utica, N. Y.
Bury Compressor Co., Erie, Pa.
Chicago Pneumatic Tool Co., New York, N. Y.
Cooper Co., Clark, Palmyra, N. J.
● Curtis Refrigerating Machine Co., St. Louis, Mo.
Davey Compressor Co., Kent, O.
Dayton Air Compressor Co., Dayton, O.
DeVilbiss Co., The, Toledo, O.
Essick Mfg. Co., Los Angeles, Calif.
Fuller Co., Catasauqua, Pa.
Gardner-Denver Co., Quincy, Ill.
Gilbert & Barker Mfg. Co., West Springfield, Mass.
Hobart Bros. Co., Troy, O.
● Ingersoll-Rand, New York, N. Y.
Lammert & Mann Co., Chicago, Ill.
● Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
● Nash Engineering Co., South Norwalk, Conn.
North Penn Co., New York, N. Y.
Pennsylvania Pump & Compressor Co., Easton, Pa.
Plummer Spray Equipment Co., Napoleon, O.
Schramm, Inc., West Chester, Pa.
Spencer Turbine Co., Hartford, Conn.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Trimount Rotary Power Co., East Dedham, Mass.
Uniflow Mfg. Co., Erie, Pa.
Union Steam Pump Co., Battle Creek, Mich.
● Worthington Pump & Machinery Corp., Harrison, N. J.
Yeomans Bros. Co., Chicago, Ill.

COMPRESSORS, REFRIGERATING, CENTRIFUGAL

Carrier Corp., Syracuse, N. Y. (Carrene)
DeLaval Steam Turbine Co., Trenton, N. J. (Water vapor)
● Ingersoll-Rand, New York, N. Y. (Water vapor)
● Trane Co., The La Crosse, Wis.
● Worthington Pump & Machinery Corp., Air Conditioning & Refrigeration Div., Harrison, N. J.
York Corp, York, Pa.

COMPRESSORS, REFRIGERATING, RECIPROCATING

● Airtemp, Div. of Chrysler Corp., Dayton, O. (Radial)
● Baker Ice Machine Co., Inc., Omaha, Nebr. ("Freon," Methyl chloride, Ammonia)
Brunner Mfg. Co., Utica, N. Y. (Methyl chloride, "Freon," sulphur dioxide)
Carrier Corp., Syracuse, N. Y. ("Freon")
Copeland Refrigeration Corp., Sidney, O.
● Curtis Refrigerating Machine Co., St. Louis, Mo.
Diceler Corp., The, Gasport, N. Y.
Fairbanks, Morse & Co., Chicago, Ill.
Frick Co., Waynesboro, Pa. (Ammonia, carbon dioxide, methyl chloride, "Freon")
Frigidaire Div., General Motors Corp., Dayton, O.
Gale Products, Galesburg, Ill.
General Electric Co., Air Conditioning and Commercial Refrigeration Divisions, Bloomfield, N. J.
General Machinery Co., Spokane, Wash.
General Refrigeration Div., Yates-American Machine Co., Beloit, Wis.
Howe Ice Machine Co., Chicago, Ill. ("Freon," ammonia, methyl chloride)
● Ingersoll-Rand, New York, N. Y.
Kauffman Air Conditioning Corp., St. Louis, Mo.
Kelvinator Div., Nash-Kelvinator Corp., Detroit, Mich.
Lynch Mfg. Corp., Defiance, O.
Merchant & Evans Co., Philadelphia, Pa. ("Freon," methyl chloride, sulphur dioxide)
Mills Industries, Inc., Chicago, Ill.
Phoenix Ice Machine Co., Cleveland, O.
Reliance Refrigerating Machine Co., Chicago, Ill. ("Freon," methyl chloride, ammonia)
Reynolds Mfg. Co., Inc., Springfield, Mo.
Servel, Inc., Electric Refrigeration & Air Conditioning Div., Evansville, Ind. ("Freon," methyl chloride)
Starr Piano Co., Richmond, Ind.
Stewart Ice Machine Co., Los Angeles, Calif.
Tecumseh Products Co., Tecumseh, Mich.
● Trane Co., The, La Crosse, Wis.
Universal Cooler Corp., Marion, O. (Methyl chloride, "Freon")
Vilter Mfg. Co., Milwaukee, Wis. ("Freon," ammonia)
Westinghouse Electric & Mfg. Co., Springfield, Mass.
Williams Oil-O-Matic Heating Corp., Bloomington, Ill. ("Freon," methyl chloride)
Wittenmeier Machinery Co., Chicago, Ill. (Carbon dioxide)
● Worthington Pump & Machinery Corp., Air Conditioning & Refrigeration Div., Harrison, N. J.
XL Refrigerating Co., Chicago, Ill. (Ammonia, methyl chloride)
Yeomans Bros. Co., Chicago, Ill. (rotary booster)
York Corp., York, Pa. (Carbon dioxide, ammonia, "Freon")

COMPRESSORS, REFRIGERATING, STEAM JET

Croll-Reynolds Engrg. Co., Inc., New York, N. Y.
Elliott Co., Jeannette, Pa.
● Ingersoll-Rand, New York, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Wheeler Mfg. Co., C. H., Philadelphia, Pa.
● Worthington Pump & Machinery Corp., Air Conditioning & Refrigeration Div., Harrison, N. J.

COMPRESSORS, STEAM BOOSTER

● Ingersoll-Rand, New York, N. Y.
Pennsylvania Pump & Compressor Co., Easton, Pa.
Schutte & Koerting Co., Philadelphia, Pa.
● Worthington Pump & Machinery Corp., Harrison, N. J.

CONDENSATION METERS

See Meters, Condensation

CONDENSATION PUMPS

See Pumps, Condensation

CONDENSERS, REFRIGERATING, EVAPORATIVE

- Acme Industries, Inc., Jackson, Mich.
- American Cooling Tower Co., Kansas City, Mo.
- ● Baker Ice Machine Co., Inc., Omaha, Nebr.
- ● Buffalo Forge Co., Buffalo, N. Y.
- Carrier Corp., Syracuse, N. Y.
- ● Curtis Refrigerating Machine Co., St. Louis, Mo.
- Drayer & Hanson, Inc., Los Angeles, Calif.
- Frick Co., Waynesboro, Pa.
- Frigidaire Div., General Motors Corp., Dayton, O.
- ● G & O Mfg. Co., New Haven, Conn.
- General Electric Co., Air Conditioning and Commercial Refrigeration Divisions, Bloomfield, N. J.
- General Refrigeration Div., Yates-American Machine Co., Beloit, Wis.
- Harry Cooling Towers, Inc., New York, N. Y.
- Hess Warming & Ventilating Co., Chicago, Ill.
- Larkin Coils, Inc., Atlanta, Ga.
- Long Mfg., Div. Borg-Warner Corp., Detroit, Mich.
- ● Marlo Coil Co., St. Louis, Mo.
- McQuay, Inc., Minneapolis, Minn.
- ● Murray Mfg. Co., D. J., Wausau, Wis.
- ● New England Cooling Tower Co., Boston, Mass.
- Niagara Blower Co., New York, N. Y.
- Peerless of America, Inc., Chicago, Ill.
- Refrigeration Economics Co., Inc., Canton, O.
- Richmond Engrg. Co., Inc., Richmond, Va.
- ● Trane Co., The, La Crosse, Wis.
- Vilter Mfg. Co., Milwaukee, Wis.
- Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
- Whiting Corp., Harvey Ill.
- ● Worthington Pump & Machinery Corp., Air Conditioning & Refrigeration Div., Harrison, N. J.
- XL Refrigerating Co., Chicago, Ill.
- Yates-American Machine Co., Beloit, Wis.
- York Corp., York, Pa.
- ● Young Radiator Co., Racine, Wis.

CONDENSERS, REFRIGERATING, SHELL AND TUBE

- Acme Industries, Inc., Jackson, Mich.
- ● Allis-Chalmers Mfg. Co., Milwaukee, Wis.
- ● Baker Ice Machine Co., Inc., Omaha, Nebr.
- ● Bell & Gossett Co., Morton Grove, Ill.
- Biggs Boiler Works Co., E. Akron, O.
- Carrier Corp., Syracuse, N. Y. (Carrene)
- Chase Brass & Copper Co., Waterbury, Conn.
- ● Curtis Refrigerating Machine Co., St. Louis, Mo.
- Devine Mfg. Co., Inc., J. P., Mt. Vernon, Ill.
- Downingtown Iron Works, Downingtown, Pa.
- Drayer & Hanson, Inc., Los Angeles, Calif.
- Frick Co., Waynesboro, Pa.
- Frigidaire Div., General Motors Corp., Dayton, O.
- General Electric Co., Air Conditioning & Commercial Refrigeration Divisions, Bloomfield, N. J.
- General Refrigeration Div., Yates-American Machine Co., Beloit, Wis.
- Heat Transfer Products, Inc., New York, N. Y.
- Howard Iron Works & Alberger Heater Co., Buffalo, N. Y.
- Howe Ice Machine Co., Chicago, Ill.
- Kopperman & Sons, Joseph, Philadelphia, Pa.
- ● Kramer Trenton Co., Trenton, N. J.
- Ohio Pipe Bending & Machine Co., Cleveland, O.
- ● Patterson-Kelley Co., Inc., East Stroudsburg, Pa.
- Refrigeration Economics Co., Inc., Canton, O.
- Reliance Refrigerating Machine Co., Chicago, Ill.
- Reynolds Mfg. Co., Inc., Springfield, Mo.
- Richmond Engrg. Co., Inc., Richmond, Va.
- Roessing Mfg. Co., Pittsburgh, Pa.
- Rome-Turney Radiator Co., Rome, N. Y.
- Ross Heater & Mfg. Co., Inc., Buffalo, N. Y.
- Servel, Inc., Electric Refrigeration & Air Conditioning Div., Evansville, Ind.
- Stewart Ice Machine Co., Los Angeles, Calif.
- Struthers Wells Corp., Titusville, Pa.
- ● Trane Co., The, LaCrosse, Wis.
- Union Steam Pump Co., Battle Creek, Mich.
- Vilter Mfg. Co., Milwaukee, Wis.
- Vogt Machine Co., Henry, Louisville, Ky.
- Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
- ● Whitlock Mfg. Co., Hartford, Conn.
- Wittenmeier Machinery Co., Chicago, Ill.
- ● Worthington Pump & Machinery Corp., Air Conditioning & Refrigeration Div., Harrison, N. J.
- XL Refrigrating Co., Chicago, Ill.
- York Corp., York, Pa.
- ● Young Radiator Co., Racine, Wis.
- Zallea Brothers & Johnson, Wilmington, Del.

CONDENSING UNITS

See Compressors

CONDUIT, UNDERGROUND PIPING

- ● American District Steam Co., North Tonawanda, N. Y.
- Dockstader, S. E., Washington, D. C.
- Ehret Magnesia Mfg. Co., Valley Forge, Pa.
- Johns-Manville, New York, N. Y.
- Michigan Pipe Co., Bay City, Mich.
- Munn & Steele, Inc., Newark, N. J.
- ● Porter & Co., Inc., H. W., Newark, N. J.
- ● Ric-wiL Co., Cleveland, O.
- ● Spang-Chalfant, Div. of National Supply Co., Pittsburgh, Pa.
- Underground Steam Construction Co., Boston, Mass.
- Wyckoff & Son Co., A., Elmira, N. Y.

CONNECTIONS, DUCT, FLEXIBLE (ASBESTOS, CANVAS, ETC.)

- Canvas Products Co., St. Louis, Mo.
- Felters Co., Inc., Boston, Mass.
- United States Rubber Co., New York, N. Y.
- ● Wilson, Inc., Grant, Chicago, Ill. (Asbestos)

CONNECTORS, FOR NON-METALLIC DUCT FABRICATION

- Acme Steel Co., Chicago, Ill. (strapping)
- ● Dravo Corp., Pittsburgh, Pa.
- Klomparens Lock-Joint Co., Arlington, Va.
- Lumm Co., A. H., Toledo, O.
- ● Sheetlock Co., Chicago, Ill.

CONTROL, FOR INDIRECT WATER HEATERS

- Armstrong Heat Control Co., Portland, Ore.
- ● Bell & Gossett Co., Morton Grove, Ill.
- ● Mercoid Corp., The, Chicago, Ill.
- ● Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
- ● Reading-Pratt & Cady Div., American Chain & Cable Co., Inc., Reading, Pa.
- ● Sarcotherm Controls, Inc., Chicago, Ill.
- Taco Heaters, Inc., New York, N. Y.
- ● Thrush & Co., H. A., Peru, Ind.

CONTROLLERS AND STARTERS, MOTOR

- Allen-Bradley Co., Milwaukee, Wis.
- ● Allis-Chalmers Mfg. Co., Milwaukee, Wis.
- Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.
- B/W Controller Corp., Birmingham, Mich.
- Clark Controller Co., Cleveland, O.
- Cutler-Hammer, Inc., Milwaukee, Wis.
- Electric Controller & Mfg. Co., Cleveland, O.
- Electric Machinery Co., Minneapolis, Minn. (Synchronous motor)
- General Electric Co., Schenectady, N. Y.
- Hart Mfg. Co., Hartford, Conn.
- Monitor Controller Co., The, Baltimore, Md.
- ● Penn Electric Switch Co., Goshen, Ind.
- Reynolds Electric Co., Chicago, Ill.
- Square D Co., Industrial Controller Div., Milwaukee, Wis.
- Trumbull Electric Mfg. Co., Plainville, Conn.
- Ward Leonard Electric Co., Mt. Vernon, N. Y.
- Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
- Zenith Electric Co., Chicago, Ill.

CONTROLS, AIR CONDITIONING

See Humidistats; Indicator-Controllers; Operators, Dampers; Operators, Valve; Recorder-Controllers; Regulators; Relays; Switches; Thermostats; Valves, Diaphragm; Valves, Refrigeration; Valves, Solenoid

CONTROLS, DOOR, ELECTRIC EYE (FOR AIR CONDITIONED ROOMS)

- Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
- Yale & Towne Mfg. Co., Stamford, Conn.

CONTROLS, DRAFT, BAROMETRIC

- Cole-Sullivan Engineering Co., Minneapolis, Minn.
- Field Control Div., H. D. Conkey & Co., Mendota, Ill.
- ● Hotstream Heater Co., Cleveland, O.
- Preferred Utilities Co., Inc., New York, N. Y.
- Simplex Mfg. Co., Fond du Lac, Wis.

CONTROLS, FIRE PROTECTION SPRINKLER SYSTEMS

- ● Barber-Colman Co., Rockford, Ill.
- ● Grinnell Co., Inc., Providence, R. I.
- Rockwood Sprinkler Co., Worcester, Mass.

CONTROLS, HEATING

See Alarms; Humidistats; Indicator-Controllers; Operators, Damper; Operators, Valve; Recorder-Controllers; Regulators; Relays; Switches; Systems, Combustion Control; Systems, Heating; Thermostats; Valves, Balancing, Radiator; Valves, Diaphragm; Valves, Flow Control; Valves, Mixing; Valves, Pressure Reducing and Regulating; Valves, Radiator; Valves, Solenoid

CONTROLS, REFRIGERATION

See Humidistats; Operators, Valves; Relays; Switches; Thermostats; Valves, Refrigeration; Valves, Solenoid

CONVECTORS

See Radiation, Convection Type

CONVEYORS, COAL AND ASH

- Allen Billmyre Co., Mamaroneck, N. Y.
- Jeffrey Mfg. Co., Columbus, O.

● Advertisement in this issue. See Index to Advertisers, page 322.

La-Del Conveyor & Mfg. Co., New Philadelphia, O.
● Link-Belt Co., Chicago, Ill.
● Stephens-Adamson Mfg. Co., Aurora, Ill.

COOLERS, OIL

● Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Andale Co., Philadelphia, Pa.
American Locomotive Co., Alco Products Div., New York, N. Y.
● Bell & Gossett Co., Morton Grove, Ill.
Croll-Reynolds Engineering Co., Inc., New York, N. Y.
Davis Engineering Corp., Elizabeth, N. J.
Devine Mfg. Co., Inc., J. P., Mt. Vernon, Ill.
Downingtown Iron Works, Downingtown, Pa.
Elliott Co., Jeannette, Pa.
Frank Heaters, Inc., Paterson, N. J.
● G & O Mfg. Co., New Haven, Conn.
Griscom-Russell Co., The, New York, N. Y.
● Kramer Trenton Co., Trenton, N. J.
● Modine Mfg. Co., Racine, Wis.
National Pipe Bending Co., New Haven, Conn.
● Patterson-Kelley Co., Inc., East Stroudsburg, Pa.
Refrigeration Economics Co., Inc., Canton, O.
Rome-Turney Radiator Co., Rome, N. Y.
Ross Heater & Mfg. Co., Inc., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Shaw-Perkins Mfg. Co., Pittsburgh, Pa.
Sims Co., Erie, Pa.
Standard Heater & Oil Equipment Co., Jersey City, N. J.
Struthers Wells Corp., Titusville, Pa.
● Trane Co., The, La Crosse, Wis.
Vogt Machine Co., Henry, Louisville, Ky.
Wheeler Mfg. Co., C. H., Philadelphia, Pa.
● Whitlock Mfg. Co., Hartford, Conn.
● Worthington Pump & Machinery Corp., Air Conditioning & Refrigeration Div., Harrison, N. J.
York Corp., York, Pa.
● Young Radiator Co., Racine, Wis.
Zallea Brothers & Johnson, Wilmington, Del.

COOLERS, UNIT (FLOOR TYPE)

Not air conditioning units, but floor mounted unit with coil and centrifugal fans without filters, for connection to remote compressor or cold water supply. For air conditioning units see Units, Air Conditioning

Acme Industries, Inc., Jackson, Mich.
American Blower Corp., Detroit, Mich.
● Baker Ice Machine Co., Inc., Omaha, Neb.
Beacon-Morris Corp., Boston, Mass. (Custom built)
● Buffalo Forge Co., Buffalo, N. Y.
● Bush Mfg. Co., Hartford, Conn.
Carrier Corp., Syracuse, N. Y.
● Clarage Fan Co., Kalamazoo, Mich.
Conditionaire Unit Co., Chicago, Ill.
● Curtis Refrigerating Machine Co., St. Louis, Mo.
Drayer & Hanson, Inc., Los Angeles, Cal.
Economy Equipment Co., Chicago, Ill.
Frick Co., Waynesboro, Pa.
General Refrigeration Div., Yates-American Machine Co., Beloit, Wis.
Howe Ice Machine Co., Chicago, Ill.
Industrial Mfg. & Engineering Co., Chicago, Ill.
Kauffman Air Conditioning Corp., St. Louis, Mo.
● Kennard, Inc., Sam, St. Louis, Mo.
● Kramer Trenton Co., Trenton, N. J.
Larkin Coils, Inc., Atlanta, Ga.
● Marlo Coil Co., St. Louis, Mo.
McQuay, Inc., Minneapolis, Minn.
● Murray Mfg. Co., D. J., Wausau, Wis.
Niagara Blower Co., New York, N. Y.
Peerless of America, Inc., Chicago, Ill.
Refrigeration Appliances, Inc., Chicago, Ill.
Refrigeration Economics Co., Inc., Canton, O.
Richmond Engineering Co., Inc., Richmond, Va.
● Skinner Heating & Ventilating Co., Inc., Div. of St. Louis Blow Pipe & Heater Co., St. Louis, Mo.
● Trane Co., The, La Crosse, Wis.
● United States Air Conditioning Corp., Minneapolis, Minn.
Vilter Mfg. Co., Milwaukee, Wis.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
X L Refrigerating Co., Chicago, Ill.
York Corp., York, Pa.
● Young Radiator Co., Racine, Wis.

COOLERS, UNIT (SUSPENDED TYPE)

Not air conditioning units, but suspended unit with coil and propellor fan, without filters, for connection to remote compressor or cold water supply. For air conditioning units, see Units, Air Conditioning

American Blower Corp., Detroit, Mich.
American Coils, Inc., Newark, N. J.
● Baker Ice Machine Co., Inc., Omaha, Nebr.
Beacon-Morris Corp., Boston, Mass. (Custom built)
Bern's Specialty Mfg. Co., Chicago, Ill.
Betz Corp., Hammond, Ind.
● Buffalo Forge Co., Buffalo, N. Y.
● Bush Mfg. Co., Hartford, Conn.
Campbell Heating Co., E. K., Kansas City, Mo.
Carrier Corp., Syracuse, N. Y.
● Clarage Fan Co., Kalamazoo, Mich.
Conditionaire Unit Co., Chicago, Ill.
● Curtis Refrigerating Machine Co., St. Louis, Mo.
Drayer & Hanson, Inc., Los Angeles, Calif.
● Fedders Mfg. Co., Inc., Buffalo, N. Y.
General Electric Co., Air Conditioning and Commercial Refrigeration Divisions, Bloomfield, N. J.
General Refrigeration Div., Yates-American Machine Co., Beloit, Wis.
Howe Ice Machine Co., Chicago, Ill.
● Ilg Electric Ventilating Co., Chicago, Ill.
● Johnson Fan & Blower Corp., Chicago, Ill.
Kauffman Air Conditioning Corp., St. Louis, Mo.
● Kennard, Inc., Sam, St. Louis, Mo.
King Ventilating Co., Owatonna, Minn.
● Kramer Trenton Co., Trenton, N. J.
Larkin Coils, Inc., Atlanta, Ga.
● Marlo Coil Co., St. Louis, Mo.
● McCord Radiator & Mfg. Co., Detroit, Mich.
McQuay, Inc., Minneapolis, Minn.
Merchant & Evans Co., Philadelphia, Pa.
● Murray Mfg. Co., D. J., Wausau, Wis.
Niagara Blower Co., New York, N. Y.
Peerless of America, Inc, Chicago, Ill.
Refrigeration Appliances, Inc., Chicago, Ill.
Refrigeration Economics Co., Inc., Canton, O.
Rempe Co., Chicago, Ill.
Richmond Engrg. Co., Inc., Richmond, Va.
● Skinner Heating & Ventilating Co., Inc., Div. of St. Louis Blow Pipe & Heater Co., St. Louis, Mo.
Super Radiator Corp., Minneapolis, Minn.
Thermal Co., Inc., Milwaukee, Wis.
● Trane Co., The, La Crosse, Wis.
● United States Air Conditioning Corp., Minneapolis, Minn.
Vilter Mfg. Co., Milwaukee, Wis.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
● Wing Mfg. Co., L. J., New York, N. Y.
X L Refrigerating Co., Chicago, Ill.
York Corp., York, Pa.
● Young Radiator Co., Racine, Wis.

COOLING COILS

See Surface, Cooling

COOLING SURFACE

See Surface, Cooling

COOLING TOWERS

See Towers, Cooling

COOLING UNITS

See Units, Air Conditioning; Coolers, Unit

COPPER PIPE

See Pipe, Brass and Copper

COPPER SHEETS

See Sheets, Copper

COPPER TUBE FITTINGS

See Fittings, Copper Tube

COPPER TUBING

See Tubing, Brass and Copper

CORROSION PREVENTIVES

See Treatment, Steam System, to Inhibit Corrosion; and Treatment, Water, to Inhibit Corrosion

COUNTERS, DUST

Bausch & Lomb Optical Co., Rochester, N. Y.
Service to Industry, West Hartford, Conn.
Willson Products, Inc., Reading, Pa.

COUPLINGS, FLEXIBLE, POWER TRANSMISSION

Ajax Flexible Coupling Co., Westfield, N. Y.
● Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American Flexible Coupling Co., Erie, Pa.
Blood Brothers Machine Co., Allegan, Mich. (Universal joints)
Boston Gear Wks., Inc., North Quincy, Mass.
Browning Mfg. Co., Inc., Maysville, Ky.
Caldwell Co., W. E., Louisville, Ky.
Certified Flexible Couplings, New York, N. Y.
Chain Belt Co., Milwaukee, Wis.
Chicago Die Casting Mfg. Co., Chicago, Ill.
Congress Die Casting Div., Congress Tool & Die Co., Detroit, Mich.
Continental Diamond Fibre Co., Newark, Del.
● Crocker-Wheeler Electric Mfg. Co. Div., Joshua Hendy Iron Works, Ampere, N. J.
De Laval Steam Turbine Co., Trenton, N. J.
Diamond Chain & Mfg. Co., Indianapolis, Ind.
Dodge Mfg. Corp., Mishawaka, Ind.
Flexo Supply Co., Inc., St. Louis, Mo.
Guardian Utilities Co., Michigan City, Ind.
Jeffrey Mfg. Co., Columbus, O.
Jones Foundry & Machine Co., W. A., Chicago, Ill.
Koppers Co., Bartlett Hayward Div., Baltimore, Md.
● Link-Belt Co., Indianapolis, Ind.

● Advertisement in this issue. See Index to Advertisers, page 322.

Lord Mfg. Co., Erie, Pa.
Lovejoy Flexible Coupling Co., Chicago, Ill.
Medart Co., St. Louis, Mo.
Mercury Clutch Corp., Canton, O.
Moran Flexible Steam Joint Co., Louisville, Ky.
Morse Chain Co., Ithaca, N. Y.
Poole Foundry & Machine Co., Baltimore, Md.
Ramsey Chain Co., Inc., Albany, N. Y.
Shallcross Co., Philadelphia, Pa.
Smith, Inc., Winfield H., Springville, N. Y.
Stewart-Rogers, Inc., Philadelphia, Pa.
Stow Mfg. Co., Binghampton, N. Y.
Thermoid Rubber, Div. of Thermoid Co., Trenton, N. J.
United States Rubber Co., New York, N. Y.
Waldron Corp., John, New Brunswick, N. J.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Whitney Chain & Mfg. Co., The, Hartford, Conn.
Wood's Sons Co., T. B., Chambersburg, Pa.

COUPLINGS, PIPE

Alabama Pipe Co., Anniston, Ala. (Cast iron)
● Byers Co., A. M., Pittsburgh, Pa. (wrought iron)
Champion Machine & Forging Co., Cleveland, O.
Clow & Sons, James B., Chicago, Ill.
Colonial Alloys Co., Metals Div., Philadelphia, Pa. (Stainless)
Conklin Brass & Copper Co., Inc., T. E., New York, N. Y.
● Crane Co., Chicago, Ill.
Detroit Brass & Malleable Works, Detroit, Mich.
Dillon Co., Tulsa, Okla.
Dresser Mfg. Co., Bradford, Pa.
Flagg & Co., Inc., Stanley G., Philadelphia, Pa.
● Flori Pipe Co., The, St. Louis, Mo.
Grabler Mfg. Co., Cleveland, O.
● Grinnell Co., Inc., Providence, R. I.
Gustin Bacon Mfg. Co., Kansas City, Mo.
H. & B. Sales Co., Ltd., Long Beach, Calif. (Swing joint)
Hanlon-Waters, Inc., Tulsa, Okla.
Harrisburg Steel Corp., Harrisburg, Pa.
Hasco Valve & Machine Co., Milwaukee, Wis.
Illinois Malleable Iron Co., Chicago, Ill.
Jarecki Mfg. Co., Erie, Pa.
Jefferson Union Co., Lockport, N. Y.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
● Kennedy Valve Mfg. Co., Elmira, N. Y.
King Union Co., Inc., Hillsgrove, R. I.
Malleable Iron Fittings Co., Branford, Conn.
Mueller Brass Co., Port Huron, Mich.
National Tube Co., United States Steel Corp. Sub., Pittsburgh, Pa.
Pittsburgh Steel Co., Pittsburgh, Pa.
Pittsburgh Valve & Fittings Corp., Barberton, O.
Ravena Iron Co., Ravena, N. Y. (Cast iron)
Republic Steel Corp., Cleveland, O.
Rhode Island Fittings Co., Hillsgrove, R. I.
Semler Co., Jeannette, Pa.
Stockham Pipe Fittings Co., Birmingham, Ala.
Stokes Rubber Co., Jos., Trenton, N. J. (Hard rubber)
Superior Railway Products Corp., Pittsburgh, Pa.
Union Metal Works, Chelsea, Mass.
United States Stoneware Co., New York, N. Y.
Victaulic Co. of America, New York, N. Y.
Vogt Machine Co., Henry, Louisville, Ky.
● Walworth Co., New York, N. Y.
Ward Foundries, Inc., J. P., Blossburgh, Pa.
Watson-Stillman Co., Roselle, N. J.
Weatherhead Co., Cleveland, O.
Wheeling Machine Products Co., Wheeling, W. Va.
● Youngstown Sheet & Tube Co., Youngstown, O.

COUPLINGS, PIPE, DETACHABLE

Packless Metal Products Corp., New Rochelle, N. Y.
Victaulic Co. of America, New York, N. Y.
Wiggins Oil Tool Co., Inc., E. B., Los Angeles, Calif.

CUT-OFFS, LOW WATER, HEATING BOILER

B/W Controller Corp., Birmingham, Mich.
● General Controls Co., Glendale, Calif.
Johnson Corp., Three Rivers, Mich.
● Kieley & Mueller, Inc., North Bergen, N. J.
● Maid-O'-Mist, Inc., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
● McDonnell & Miller, Chicago, Ill.
● Mercoid Corp., The, Chicago, Ill.
● Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
● Penn Electric Switch Co., Goshen, Ind.
Schaub Engineering Co., Fred H., Chicago, Ill.
Strong, Carlisle & Hammond Co., Cleveland, O.
Watts Regulator Co., Lawrence, Mass.
● Webster & Co., Warren, Camden, N. J.
Wright-Austin Co., Detroit, Mich.

CUTTERS, PIPE

American Pipe Tool Co., Chicago, Ill.
Armstrong Bros. Tool Co., Chicago, Ill.
Armstrong Mfg. Co., Bridgeport, Conn.
Barnes Tool Co., The, New Haven, Conn.
Beaver Pipe Tools, Inc., Warren, O.
Bernz Co., Inc., Otto, Rochester, N. Y.
C-B Tool Co., Lancaster, Pa.
Crown Die & Tool Co., Chicago, Ill.
Erie Tool Works, Erie, Pa.
Hollands Mfg. Co., Erie, Pa.
Imperial Brass Mfg. Co., Chicago, Ill.
International Nutyp Tool Co., Oswego, N. Y.
Jarecki Mfg. Co., Erie, Pa.
National Machine Wks., Chicago, Ill.
Nye Tool & Machine Co., Chicago, Ill.
Oster Mfg. Co., Cleveland, O.
Ridge Tool Co., Elyria, O.
Sac Tool Mfg. Co., St. Louis, Mo.
Toledo Pipe Threading Machine Co., Toledo, O.
Trimont Mfg. Co., Boston, Mass.
● Wallace Supplies Mfg. Co., Chicago, Ill.

CUTTERS, TUBING

Armstrong Mfg. Co., Bridgeport, Conn.
Beaver Pipe Tools, Inc., Warren, O.
Bernz Co., Inc., Otto, Rochester, N. Y.
● Bonney Forge & Tool Works, Allentown, Pa.
Conklin Brass & Copper Co., Inc., T. E., New York, N. Y.
Imperial Brass Mfg. Co., Chicago, Ill.
Jarecki Mfg. Co., Erie, Pa.
Mueller Brass Co., Port Huron, Mich.
Nye Tool & Machine Co., Chicago, Ill.
Parker Appliance Co., Cleveland, O.
Perfection Refrigeration Parts Co., Harvey, Ill.
Ridge Tool Co., Elyria, O.
Sac Tool Mfg. Co., St. Louis, Mo.
Snap-On Tools Corp., Kenosha, Wis.
Trimont Mfg. Co., Boston, Mass.
● Wallace Supplies Mfg. Co., Chicago, Ill.
Weatherhead Co., Cleveland, O.

DAMPER OPERATORS

See Operators, Damper

DAMPER REGULATORS

See Regulators, Damper Sets

DAMPERS, DUCT, MANUALLY OPERATED

Acme Tin Plate & Roofing Supply Co., Philadelphia, Pa.
Adams Co., The, Dubuque, Ia.
Air Conditioning Products Co., Detroit, Mich.
Corbman Bros., Inc., Philadelphia, Pa.
Elgo Shutter & Mfg. Co., Detroit, Mich.
Excelsior Steel Furnace Co., Chicago, Ill.
Jacobs Co., B. & J., Cincinnati, O.
Kerentoff, G. L., Cincinnati, O.
Ohio Products Co., Cleveland, O.
Richmond Radiator Co., Gas Products Div., Uniontown, Pa.
Salina Metal Products Co., Salina, Kans.
United States Register Co., Battle Creek, Mich.
Waterloo Register Co., Waterloo, Ia.
Young Regulator Co., Cleveland, O.

DAMPERS, DUCT, REMOTE CONTROLLED

Air Conditioning Products Co., Detroit, Mich.
American Warming & Ventilating Co., Toledo, O.
Au-Temp-Co Corp., New York, N. Y.
● Barber-Colman Co., Rockford, Ill.
Brooke Engineering Co., Inc., Philadelphia, Pa.
● Johnson Service Co., Milwaukee, Wis.
● Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
● Penn Electric Switch Co., Goshen, Ind.
● Powers Regulator Co., Chicago, Ill.
Shallcross Controls, Inc., Milwaukee, Wis.
Stuart Co., W. W., Des Moines, Ia.
● Tuttle & Bailey, Inc., New Britain, Conn.
Vapor Car Heating Co., Inc., Chicago, Ill.
Waterloo Register Co., Waterloo, Ia.
Young Regulator Co., Cleveland, O.

DEAERATORS

Cochrane Corp., Philadelphia, Pa.
Croll-Reynolds Engrg. Co., Inc., New York, N. Y.
Elliott Co., Jeannette, Pa.
Graver Tank & Mfg. Co., Inc., East Chicago, Ind.
Heat Transfer Products, Inc., New York, N. Y.
Hoppes Mfg. Co., Springfield, O.
Permutit Co., New York, N. Y.
Ross Heater & Mfg. Co., Inc., Buffalo, N. Y.
Sims Co, Erie, Pa.
Stickle Steam Specialties Co., Indianapolis, Ind.
Swartwout Co., Cleveland, O.
● Worthington Pump & Machinery Corp., Harrison, N. J.

DEEP WELL PUMPS

See Pumps, Deep Well

DEHUMIDIFIERS, ABSORPTION AND ADSORPTION

● Air & Refrigeration Corp., New York, N. Y.
American Injector Co., Detroit, Mich.
Aqua-Sorb Co., East Orange, N. J.
● Bryant Heater Co., The, Cleveland, O. (Silica gel)
Carbide and Carbon Chemicals Corp., New York, N. Y. (Triethylene Glycol)

● Advertisement in this issue. See Index to Advertisers, page 322.

Cargocaire Engineering Corp., New York, N. Y. (for ships)
Carrier Corp., Syracuse, N. Y.
Davison Chemical Corp., The, Baltimore, Md.
Floridin Co., Warren, Pa.
General Air Conditioning Corp., Cincinnati, O.
Kaufman, H. J., Detroit, Mich.
Pittsburgh Lectrodryer Corp., Pittsburgh, Pa.
Research Corp., New York, N. Y.
Solvay Sales Corp., New York, N. Y.
Surface Combustion, Toledo, O.
Tamms Silica Co., Chicago, Ill.

DEHUMIDIFYING UNITS

See Units, Air Conditioning; Dehumidifiers, Absorption and Adsorption

DEHYDRANT AND ACID NEUTRALIZER, FOR REFRIGERATING SYSTEMS

American Injector Co., Detroit, Mich.
Davison Chemical Corp., The, Baltimore, Md.
Highside Chemicals Co., Newark, N. J.
Weatherhead Co., Cleveland, O.

DEHYDRATORS, REFRIGERANT

Aluminum Co. of America, Pittsburgh, Pa.
American Injector Co., Detroit, Mich.
● Automatic Products Co., Milwaukee, Wis.
Davison Chemical Corp., The, Baltimore, Md.
Floridin Co., Warren, Pa.
● Henry Valve Co., Chicago, Ill.
Imperial Brass Mfg. Co., Chicago, Ill.
Kerotest Mfg. Co., Pittsburgh, Pa.
● Research Products Corp., Madison, Wis.
Superior Valve and Fittings Co., Pittsburgh, Pa.
Weatherhead Co., Cleveland, O.

DESTROYERS, SOOT, CHEMICAL

Desolvo Co., The, Pittsburgh, Pa.
Healy Ruff Co., St. Paul, Minn.
Hercules Chemical Co., Inc., New York, N. Y.
Tamms Silica Co., Chicago, Ill.
Vinco Co., Inc., The, New York, N. Y.

DESUPERHEATERS, STEAM

Edge Moor Iron Works, Inc., New York, N. Y.
Foster Wheeler Corp., New York, N. Y.
Hagan Corp., Pittsburgh, Pa.
Northern Equipment Co., Erie, Pa.
● Patterson-Kelley Co., Inc., East Stroudsburg, Pa.
Schutte & Koerting Co., Philadelphia, Pa.
Spence Engineering Co., Inc., Walden, N. Y.

DETECTORS, LEAK, REFRIGERANT

Bernz Co., Inc., Otto, Rochester, N. Y.
Imperial Brass Mfg. Co., Chicago, Ill.
Linde Air Products Co., The, Unit of Union Carbide & Carbon Corp., New York, N. Y.
Schaub Engineering Co., Fred H., Chicago, Ill. (Leak alarm)
Turco Products, Inc., Los Angeles, Calif.
Turner Brass Wks., Sycamore, Ill.

DIAPHRAGM VALVES

See Valves, Diaphragm

DIESEL ENGINES

See Engines, Diesel, for Fan, Pump and Compressor Drives

DIFFUSERS, AIR, HIGH VELOCITY

See also Grilles; Panels, Perforated, for Air Diffusion; Registers

● Air Devices, Inc., New York, N. Y.
● Air & Refrigeration Corp., New York, N. Y.
Anemostat Corp. of America, New York, N. Y.
● Barber-Colman Co., Rockford, Ill.
Connor Engineering Corp., W. B., New York, N. Y.
Demuth & Sons, Charles, Mineola, L. I., N. Y.
Guth Co., Edwin F., St. Louis, Mo.
● Tuttle & Bailey, Inc., New Britain, Conn.
Waterloo Register Co., Waterloo, Ia.

DIFFUSION, AIR

See Panels, Perforated, for Air Diffusion

DOOR CONTROLS

See Controls, Door, Electric Eye

DOORS AND PANELS, ACCESS

American Foundry & Furnace Co., Bloomington, Ill.
American Sheet Metal Works, New Orleans, La.
● Auer Register Co., Cleveland, O.
● Clarage Fan Co., Kalamazoo, Mich.
Decatur Iron & Steel Co., Decatur, Ala.
Falstrom Co., Passaic, N. J
Kirk & Blum Mfg. Co., Cincinnati, O.
Milcor Steel Co., Milwaukee, Wis.
Rock Island Register Co., Rock Island, Ill.
Technical Ply-Woods, Chicago, Ill.
Truscon Steel Co., Youngstown, O.
● Tuttle & Bailey, Inc., New Britain, Conn.
Way Loctor Access Panel Co., Boston, Mass.

DRAFT CONTROL

See Controls, Draft, Barometric; Regulators, Draft, Combustion

DRAFT GAGES

See Gages, Indicating, Draft

DRAFT RECORDERS

See Recorders, Draft

DRAFT REGULATORS

See Controls, Draft, Barometric; Regulators, Draft, Combustion

DRILLS, ELECTRIC, PORTABLE

Albertson & Co., Inc., Sioux City, Ia.
Black & Decker Mfg. Co., Towson, Md.
Chicago Pneumatic Tool Co., New York, N. Y.
Cincinnati Electrical Tool Co., The, Cincinnati, O.
Clark, Jr., Electric Co., Jas., Louisville, Ky.
Independent Pneumatic Tool Co., Chicago, Ill.
Mall Tool Co., Chicago, Ill.
Millers Falls Co., Greenfield, Mass.
Misener Mfg. Co., Inc., Syracuse, N. Y.
Paramount Products Co., New York, N. Y.
Power King Tool Corp., Warsaw, Ind.
Signal Electric Mfg. Co., Menominee, Mich.
Skilsaw, Inc., Chicago, Ill.
Snap-On Tools Corp., Kenosha, Wis.
Speedway Mfg. Co., Chicago (Cicero), Ill.
Stanley Electric Tool Div., The Stanley Works, New Britain Conn.
Syntron Co., Homer City, Pa.
U. S. Electrical Tool Co., Cincinnati, O.
Van Dorn Electric Tool Co., Towson, Md.
Willy's Carbide Tool Co., Detroit, Mich.
Wodack Electric Tool Corp., Chicago, Ill.
York Electric & Machine Co., York, Pa.

DRIVES, CHAIN

Caldwell Co., W. E., Louisville, Ky.
Chain Belt Co., Milwaukee, Wis.
Diamond Chain & Mfg. Co., Indianapolis, Ind.
Jeffrey Mfg. Co., Columbus, O.
● Link-Belt Co., Indianapolis, Ind.
Medart Co., St. Louis, Mo.
Morse Chain Co., Ithaca, N. Y.
Ramsey Chain Co., Inc., Albany, N. Y.
Whitney Chain & Mfg. Co., The, Hartford, Conn.

DRIVES, FLAT BELT

See also Belting, Leather and Belting, Rubber

American Pulley Co., Philadelphia, Pa.
Baldwin Belting, Inc., New York, N. Y.
Browning Mfg. Co., Inc., Maysville, Ky.
Caldwell Co., W. E., Louisville, Ky.
Chicago Belting Co., Chicago, Ill.
Chicago Die Casting Mfg. Co., Chicago, Ill.
Continental Rubber Wks., Erie, Pa.
Dick Co., Inc., R. & J., Passaic, N. J.
Dodge Mfg. Corp., Mishawaka, Ind.
Gates Rubber Co., The, Denver, Colo.
Medart Co., St. Louis, Mo.
● Rhoads & Sons, J. E., Philadelphia, Pa.
Rockwood Mfg. Co., Indianapolis, Ind.
Williams & Son, I. B., Dover, N. H.
Wood's Sons Co., T. B., Chambersburg, Pa.

DRIVES, V BELT

● Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American Pulley Co., Philadelphia, Pa.
Baldwin Belting, Inc., New York, N. Y.
Browning Mfg. Co., Inc., Maysville, Ky.
Chicago Belting Co., Chicago, Ill.
Chicago Die Casting Mfg. Co., Chicago, Ill.
Congress Die Casting Div., Congress Tool & Die Co., Detroit, Mich.
Continental Rubber Wks., Erie, Pa
Dayton Rubber Mfg. Co., Dayton, O.
Dick Co., Inc., R. & J., Passaic, N. J.
Dodge Mfg. Corp., Mishawaka, Ind.
Gates Rubber Co., Denver, Colo.
Goodrich Co., B. F., Akron, O.
Horton Mfg. Co., Minneapolis, Minn.
Ideal Commutator Dresser Co., Sycamore, Ill.
Jones Foundry & Machine Co., W. A., Chicago, Ill.
Medart Co., St. Louis, Mo.
Pyott Foundry & Machine Co., Chicago, Ill.
Rockwood Mfg. Co., Indianapolis, Ind.
Thermoid Rubber, Div. of Thermoid Co., Trenton, N. J.
Wood's Sons Co., T. B., Chambersburg, Pa.
● Worthington Pump & Machinery Corp., Harrison, N. J.

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DRIVES, VARIABLE SPEED

See Changers, Speed, Hydraulic Coupling; Changers, Speed, Mechanical; Reducers, Speed; Pulleys and Sheaves, for Belt Drives

DUAL THERMOSTATS

See Thermostats, Two Temperature or Dual

DUCT CONNECTIONS

See Connections, Duct, Flexible; Connectors for Non-Metallic Duct Fabrication

DUCT HEATERS

See Heaters, Duct

DUCT INSULATION

See Insulation, Duct

DUCT THERMOSTATS

See Thermostats, Duct Type

DUCT TURNING VANES

See Vanes, Duct Turning, Prefabricated

DUCTS AND DUCT FITTINGS, PREFABRICATED, METALLIC

Acer & Whedon, Inc., Medina, N. Y.
Acme Tin Plate & Roofing Supply Co., Philadelphia, Pa.
Champion Furnace Pipe Co., Peoria, Ill.
Chandler Co., Cedar Rapids, Ia.
Char-Gale Mfg. Co., Minneapolis, Minn.
Chicago Furnace Supply Co., Chicago, Ill.
Chicago Metal Hose Corp., Maywood, Ill. (For aircraft)
Cincinnati Sheet Metal & Roofing Co., Cincinnati, O.
Corbman Bros., Inc., Philadelphia, Pa.
Excelsior Steel Furnace Co., Chicago, Ill.
Gehri Co., Tacoma, Wash.
Gray Metal Products, Inc., Rochester, N. Y.
Henry Furnace Co., The, Medina, O.
Howes-Woods Co., Cambridge, Mass.
International Heater Co., Utica, N. Y.
Jacobs Co., B. & J., Cincinnati, O.
Lamneck Products, Inc., Middletown, O.
Meyer & Bro. Co., F., Peoria, Ill.
Milcor Steel Co., Milwaukee, Wis.
Moncrief Furnace Co., Atlanta, Ga.
● Mueller Furnace Co., L. J., Milwaukee, Wis.
Richmond Radiator Co., Gas Products Div., Uniontown, Pa.
Schecter Brothers Co , Philadelphia, Pa.
Season-Aire Corp. of America, Detroit, Mich.
Smith-Raymond Co., Columbus, Ga.
United States Register Co., Battle Creek, Mich.
Williamson Heater Co., Cincinnati, O.

DUCTS AND DUCT FITTINGS, PREFABRICATED, NON-METALLIC

● Carey Mfg. Co., Philip, Cincinnati, O.
Knight, Maurice A., Akron, O. (acid fumes)
Smith-Raymond Co., Columbus, Ga.

DUST COLLECTORS

See Collectors, Dust

DUST COUNTERS

See Counters, Dust

ECONOMIZERS, FUEL

Bros Boiler & Mfg. Co., Wm., Minneapolis, Minn.
Fuel Savers, Inc., Harrisburg, Pa.
Green Fuel Economizer Co., Beacon, N. Y.
Richmond Engineering Co., Inc., Richmond, Va.
Sturtevant Co., B. F., Boston, Mass.
Zallea Brothers & Johnson, Wilmington, Del.

EJECTORS, SEWAGE

American-Marsh Pumps, Inc., Battle Creek, Mich.
Chicago Pump Co., Chicago, Ill.
Columbus Steam Pump Works Co., Columbus, O.
Economy Pumps, Inc., Hamilton, O.
● Nash Engineering Co., South Norwalk, Conn.
Penberthy Injector Co., Detroit, Mich.
Quimby Pump Div., H. K. Porter Co., Inc., Newark, N. J.
Schutte & Koerting Co., Philadelphia, Pa.
Swaby Mfg. Co., Chicago, Ill.
Taber Pump Co., Inc., Buffalo, N. Y.
Weil Pump Co., Chicago, Ill.
Yeomans Bros. Co., Chicago, Ill.

ELECTRIC AIR CLEANERS

See Cleaners, Air, Electrical

ELECTRIC DRILLS

See Drills, Electric, Portable

ELECTRIC MOTORS

See Motors, Electric

ELECTRIC SHEARS

See Shears, Electric, Portable

ELECTRIC UNIT HEATERS

See Heaters, Unit, Electric Heating Element

ELECTRIC WATER HEATERS

See Heaters, Water, Electric

ELECTRODES, ARC WELDING

● Air Reduction Sales Co., New York, N. Y.
Allegheny Ludlum Steel Corp., Brackenridge, Pa.
Allied Weld-Craft, Inc., Indianapolis, Ind.
Aluminum Co. of America, Pittsburgh, Pa.
American Agile Corp., Cleveland, O.
● American Brass Co., Waterbury, Conn.
American Steel & Wire Co., Cleveland, O.
Arcos Corp., Philadelphia, Pa.
Chicago Steel & Wire Co., Chicago, Ill.
● Electric Arc., Inc., Newark, N. J.
Ergolyte Mfg. Co., Philadelphia, Pa.
Eutectic Welding Alloys Co., New York, N. Y.
General Electric Co., Schenectady, N. Y.
Harnischfeger Corp., Milwaukee, Wis.
Hobart Bros. Co., Troy, O.
Hollup Corp., Div. of National Cylinder Gas Co., Chicago, Ill.
Laclede Steel Co., St. Louis, Mo.
● Lincoln Electric Co., Cleveland, O.
Marquette Mfg. Co., Minneapolis, Minn.
Maurath, Inc., Cleveland, O.
McKay Co., York, Pa.
Metal & Thermit Corp., New York, N. Y.
National Carbon Co., Carbon Products Div., Cleveland, O.
National Cylinder Gas Co., Chicago, Ill.
Page Steel & Wire Division of American Chain & Cable Co., Inc., Monessen, Pa.
Torchweld Equipment Div., National Cylinder Gas Co., Chicago, Ill.
Universal Power Corp., Cleveland, O.
Welding Apparatus Co., Chicago, Ill.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Wilson Welder & Metals Co., Inc., New York, N. Y.

ELIMINATORS, AIR, FOR HEATING AND PIPING SYSTEMS

● Anderson Co., V. D., The, Cleveland, O.
● Armstrong Machine Works, Three Rivers, Mich.
Beaton & Cadwell Mfg. Co., New Britain, Conn.
● Bell & Gossett Co., Morton Grove, Ill.
● Burnham Boiler Corp., Irvington, N. Y.
Dole Valve Co., The, Chicago, Ill.
Gorton Heating Corp., Cranford, N. J.
● Hoffman Specialty Co , Indianapolis, Ind.
● Illinois Engineering Co., Chicago, Ill.
● Maid-O'-Mist, Inc., Chicago, Ill.
Marsh Corp., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Mueller Steam Specialty Co., Inc., Long Island City, N. Y.
● Sarco Co., Inc., New York, N. Y.
● Sarcotherm Controls, Inc., Chicago, Ill.
● Sterling, Inc., Milwaukee, Wis.
Triplex Heating Specialty Co., Peru, Ind.
Vapor Specialty Co., New York, N. Y.
Wright-Austin Co., Detroit, Mich.

ENAMELS AND LACQUERS

Acme White Lead & Color Works, Detroit, Mich.
Acorn Refining Co., Cleveland, O.
Baer Bros., New York, N. Y.
Debevoise Co , The, Brooklyn, N. Y.
Detroit Graphite Co., Detroit, Mich.
Dragert Co., Inc., C. H., Brooklyn, N. Y.
du Pont de Nemours & Co. (Inc.), E. I., Fabrics & Finishes Dept., Wilmington, Del.
Ferro-Enamel Corp., Liquid Plastics Div., Cleveland, O.
Glidden Co., Cleveland, O.
Hague & Co., Inc , Alfred, Brooklyn, N. Y.
Hilo Varnish Corp., Brooklyn, N. Y.
Horn Co., A. C., Long Island City, N. Y.
Inter-Coastal Paint Corp., East St. Louis, Ill.
Krehbiel Co., J. H., Chicago, Ill.
Maas & Waldstein Co., Newark, N. J.
O'Brien Varnish Co., South Bend, Ind.
Pittsburgh Plate Glass Co., Pittsburgh, Pa.
Quigley Co., Inc., New York, N. Y.
Roxalin Flexible Finishes, Inc., Elizabeth, N. J.
Sherwin-Williams Co., The, Cleveland, O.
Sonneborn Sons, Inc., L., New York, N. Y.
Thompson & Co., Pittsburgh, Pa.
Tropical Paint & Oil Co., Cleveland, O.
Wailes Dove-Hermiston Corp., Westfield, N. J.
Wilhelm Co., A., Reading, Pa.
Zapon Div., Atlas Powder Co., North Chicago, Ill.

● Advertisement in this issue. See Index to Advertisers, page 322.

ENGINES, DIESEL, FOR FAN, PUMP AND COMPRESSOR DRIVES

American Locomotive Co., Auburn, N. Y.
Anderson Engine & Foundry Co., Anderson, Ind.
Baldwin De La Vergne Sales Corp., Philadelphia, Pa.
Bardco Mfg. & Sales Co., Los Angeles, Calif.
Buda Co., Harvey, Ill.
Caterpillar Tractor Co., Peoria, Ill.
Chicago Pneumatic Tool Co., New York, N. Y.
Cooper-Bessemer Corp., The, Mt. Vernon, O.
Fairbanks, Morse & Co., Chicago, Ill.
General Motors Corp., Detroit, Mich.
Hill Diesel Engine Co., Lansing, Mich.
● Ingersoll-Rand, New York, N. Y.
Waukesha Motor Co., Waukesha, Wis.
Witte Engine Works, Kansas City, Mo.
● Worthington Pump & Machinery Corp., Harrison, N. J.

ENGINES, GAS, FOR FAN, PUMP AND COMPRESSOR DRIVES

Bardco Mfg. & Sales Co., Los Angeles, Calif.
Buda Co., Harvey, Ill.
Caterpillar Tractor Co., Peoria, Ill.
Chicago Pneumatic Tool Co., New York, N. Y.
Continental Motors Corp., Detroit, Mich.
Cooper-Bessemer Corp., The, Mt. Vernon, O.
Fairbanks, Morse & Co., Chicago, Ill.
● Ingersoll-Rand, New York, N. Y.
U. S. Motors Corp., Oshkosh, Wis.
Universal Motor Co., Oshkosh, Wis
Waukesha Motor Co., Waukesha, Wis.
Williamsport Engine & Machine Co., Williamsport, Pa.
● Worthington Pump & Machinery Corp., Harrison, N. J.

ENGINES, STEAM, FOR FAN, PUMP AND COMPRESSOR DRIVES

Ames Iron Wks., Div. of Pierce, Butler Radiator Corp., Oswego, N. Y.
Elliott Co., Jeannette, Pa.
Frick Co., Waynesboro, Pa.
Harrisburg Machinery Corp., Harrisburg, Pa.
Morris Machine Wks., Baldwinsville, N. Y.
Murray Iron Wks. Co., Burlington, Ia.
Skinner Engine Co., Erie, Pa.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Troy Engine & Machine Co., Troy, Pa.
Vilter Mfg. Co., Milwaukee, Wis.

EQUIPMENT, BALANCING

Bear Mfg. Co., Industrial Div., Rock Island, Ill.
Gisholt Machine Co., Madison, Wis.

EVAPORATIVE CONDENSERS

See Condensers, Refrigerating, Evaporative

EXCHANGERS, HEAT

Acme Industries, Inc., Jackson, Mich.
Beacon-Morris Corp., Boston, Mass.
● Bell & Gossett Co., Morton Grove, Ill.
Buffalo Tank Corp., Dunellen, N. J.
Corning Glass Works, Corning, N. Y.
Graver Tank & Mfg. Co., Inc., East Chicago, Ind.
Howard Iron Works & Alberger Heater Co., Buffalo, N. Y.
Imperial Brass Mfg. Co., Chicago, Ill.
● Ingersoll-Rand, New York, N. Y.
Kellogg Co., M. W., The, New York, N. Y.
Kopperman & Sons, Joseph, Philadelphia, Pa.
Koven & Bro., Inc., L. O., Jersey City, N. J.
McQuay, Inc., Minneapolis, Minn.
● Modine Mfg. Co., Racine, Wis.
Mueller Brass Co., Port Huron, Mich.
National Carbon Co., Carbon Products Div., Cleveland, O.
National Radiator Co., The, Johnstown, Pa.
Phillips Cooling Tower Co., Inc., New York, N. Y.
Roessing Mfg. Co., Pittsburgh, Pa.
Schubert-Christy Corp., Indio, Calif.
Sims Co., Erie, Pa.
Standard Heater & Oil Equipment Co., Jersey City, N. J.
Superior Valve & Fittings Co., Pittsburgh, Pa.
● Trane Co., The, LaCrosse, Wis.
Vapor Car Heating Co., Inc., Chicago, Ill.
Vilter Mfg. Co., Milwaukee, Wis.
Vogt Machine Co., Henry, Louisville, Ky.
● Young Radiator Co., Racine, Wis.

EXHAUST HEADS

See Heads, Exhaust, for Pipe Lines

EXHAUSTERS, WELDING FUME

Belanger Fan & Blower Co., Detroit, Mich.
Belco Exhaust Fan Mfg. Co., St. Louis, Mo.
Champion Blower & Forge Co., Lancaster, Pa.
● Chelsea Fan & Blower Co., Irvington, N. J.
Chicago Pneumatic Tool Co., New York, N. Y.
Coppus Engineering Corp., Worcester, Mass.
Day Co., The, Minneapolis, Minn.
Despatch Oven Co., Minneapolis, Minn.
Dynamic Air Engineering, Inc., Los Angeles, Calif.
Klee Co., Geo. B., Cincinnati, O.
● Ruemelin Mfg. Co., Milwaukee, Wis.
Sawyer Electrical Mfg. Co., Los Angeles, Calif.
Torit Mfg. Co., St. Paul, Minn.
Utility Fan Corp., Los Angeles, Calif.
● Westinghouse Electric & Mfg. Co., Cleveland, O.
Whiting Corp., Harvey, Ill.
Wind-Way Fan & Ventilator Co., New Orleans, La.

EXPANSION BENDS

See Bends, Expansion

EXPANSION BOLTS

See Bolts, Expansion

EXPANSION JOINTS

See Joints, Pipe, Expansion

EXPANSION TANKS

See Tanks, Expansion, for Hot Water Heating Systems

EXPANSION VALVES

See Valves, Refrigeration

EXTRACTORS, PIPE

Reps Tool Co., Inc., New York, N. Y.
Ridge Tool Co., Elyria, O.

FABRICATED PIPING

See Bends; Headers; Joints, etc.

FABRICATORS, PIPE

See Headers, Welded; and Coils, Pipe

FAN BALANCING EQUIPMENT

See Equipment, Balancing

FAN BASES

See Bases and Pads, Vibration Isolating

FAN BLADES

See Blades, Propeller Fan

FAN HOUSINGS

See Housings, Fan, Centrifugal

FANS, AXIAL FLOW, PRESSURE TYPE

Bahnson Co., Winston-Salem, N. C.
● Buffalo Forge Co., Buffalo, N. Y.
● Chelsea Fan & Blower Co., Inc., Irvington, N. J.
● De Bothezat Ventilating Equipment Div., American Machin Metals, Inc., East Moline, Ill.
Dynamic Air Engineering, Inc., Los Angeles, Calif.
International Engineering, Inc., Dayton, O.
La-Del Conveyor & Mfg. Co., New Philadelphia, O.
Propellair, Inc., Springfield, O.
South Bend Air Products Corp., South Bend, Ind.
Sturtevant Co., B. F., Boston, Mass.
● Wing Mfg. Co., L. J., New York, N. Y.

FANS, CENTRIFUGAL

Advance Aluminum Castings Corp., Chicago, Ill.
Advance Fan & Blower Co., Detroit, Mich.
Air Controls, Inc., Cleveland, O.
Air-O-Line Co., The, Dallas, Tex.
● Airtherm Mfg. Co., St. Louis, Mo.
American Blower Corp., Detroit, Mich.
American Foundry & Furnace Co., Bloomington, Ill.
American Furnace Co., St. Louis, Mo.
Ames Co., W. R., San Francisco, Calif.
Atlas Heating & Ventilating Co., Ltd., San Francisco, Calif
Ballantyne Co., Omaha, Nebr.
Bayley Blower Co., Milwaukee, Wis.
Bern's Specialty Mfg. Co., Chicago, Ill.
Bishop & Babcock Mfg. Co., Cleveland, O.
Blower Application Co., Milwaukee, Wis.
Brundage Co., The, Kalamazoo, Mich.
● Buffalo Forge Co., Buffalo, N. Y.
Campbell Heating Co., Des Moines, Ia.
Campbell Heating Co., E. K., Kansas City, Mo.
Carrier Corp., Syracuse, N. Y.
Century Fan & Ventilator Co., New York, N. Y.
Champion Blower & Forge Co., Lancaster, Pa.
● Chelsea Fan & Blower Co., Irvington, N. J.
● Clarage Fan Co., Kalamazoo, Mich.
Coppus Engineering Corp., Worcester, Mass.
Day Co., The, Minneapolis, Minn.
Despatch Oven Co., Minneapolis, Minn.
Duriron Co., Inc., Dayton, O. (Acid resisting)
Eclipse Fuel Engineering Co., Rockford, Ill.
Economy Electric Mfg. Co., Chicago, Ill.
Electrovent Fan & Mfg. Co., Chicago, Ill.
Essick Mfg. Co., Los Angeles, Calif.
Furblo Co., Hermansville, Mich.

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Garden City Fan Co., Chicago, Ill.
General Blower Co., Inc., Philadelphia, Pa.
Grand Rapids Blow Pipe & Dust Arrester Co., Grand Rapids, Mich.
● Grand Rapids Die & Tool Co., Grand Rapids, Mich.
Hastings Air Conditioning Co., Hastings, Nebr.
● Ilg Electric Ventilating Co., Chicago, Ill.
Jaden Mfg. Co., Inc., F., Hastings, Nebr.
Jeffrey Mfg. Co., Columbus, O.
● Johnson Fan & Blower Corp., Chicago, Ill.
King Ventilating Co., Owatonna, Minn.
L-R Mfg. Co., Blower Div., Torrington, Conn.
Lau Blower Co., Dayton, O.
Lehigh Fan & Blower Co., Allentown, Pa
Leinweber Fan & Blower Co., Chicago, Ill.
Magirl Foundry & Furnace Works, P. H., Bloomington, Ill.
Martin Fan & Blower Co., Chicago, Ill.
Montag Stove & Furnace Wks., Portland, Ore.
Morrison Products, Inc., Cleveland, O.
Mountain States Equipment Co., Denver, Colo.
● Mueller Furnace Co., L. J., Milwaukee, Wis.
National Engineering & Mfg. Co., Kansas City, Mo.
National Mfg. & Engineering Co., Detroit, Mich.
● Nelson Corp., Herman, Moline, Ill.
New York Blower Co., Chicago, Ill.
Niagara Blower Co., New York, N. Y.
Northern Blower Co., Cleveland, O.
Northwest Stove & Furnace Wks., Inc., Portland, Ore.
Palmer Mfg. Corp., Phoenix, Ariz.
Peerless Electric Co., Warren, O.
Phelps Mfg. Co., Little Rock, Ark.
Prat-Daniel Corp., Port Chester, N. Y.
Reynolds Mfg. Co., The, Grand Rapids, Mich.
Royal Air Conditioning Equipment Co., Alhambra, Calif.
Schwitzer-Cummins Co., Indianapolis, Ind.
Semco Mfg. Co., Nashville, Tenn.
● Skinner Heating & Ventilating Co., Inc., Div. of St. Louis Blow Pipe & Heater Co., St. Louis, Mo.
Spray-Wheel Air Conditioners, Inc., Denver, Colo.
Sturtevant Co., B. F., Boston, Mass.
Supreme Heater & Ventilating Corp., Bonner Springs, Kans.
Torit Mfg. Co., St. Paul, Minn.
Trade-Wind Motorfans, Inc., Los Angeles, Calif.
● Trane Co., The, La Crosse, Wis.
● United States Air Conditioning Corp., Minneapolis, Minn.
Utility Fan Corp., Los Angeles, Calif.
Viking Air Conditioning Corp., Cleveland, O.
Western Blower Co., Seattle, Wash.
● Wing Mfg. Co., L. J., New York, N. Y.

FANS, PROPELLER

Aerovent Fan Co, Piqua, O.
Air Controls, Inc., Cleveland, O.
Aire-Foile Fan & Blower Co., Detroit, Mich.
Airmaster Corp., Chicago, Ill.
Air-O-Line Co., The, Dallas, Tex.
● Airtherm Mfg. Co., St. Louis, Mo.
● Allen Corp., Detroit, Mich.
American Blower Corp., Detroit, Mich.
American Coolair Corp., Jacksonville, Fla.
Arex Co., Chicago, Ill.
Bahnson Co., Winston-Salem, N. C.
Bayley Blower Co., Milwaukee, Wis.
Belanger Fan & Blower Co., Detroit, Mich.
Belco Exhaust Fan Mfg. Co., St. Louis, Mo.
Bern's Specialty Mfg. Co., Chicago, Ill.
Bishop & Babcock Mfg. Co., Cleveland, O.
● Buffalo Forge Co., Buffalo, N. Y.
Campbell Heating Co., E. K., Kansas City, Mo.
Century Fan & Ventilator Co., New York, N. Y.
Champion Blower & Forge Co., Lancaster, Pa.
● Chelsea Fan & Blower Co., Irvington, N. J.
Circulators & Devices Mfg. Corp., New York, N. Y.
● Clarage Fan Co., Kalamazoo, Mich.
Coppus Engineering Corp., Worcester, Mass.
Dallas Engineering Co., Inc., Dallas, Tex.
● De Bothezat Ventilating Equipment Div. American Machine & Metals, Inc., New York, N. Y.
Diehl Mfg. Co., Somerville, N. J.
Dual Air Fan Co., Chicago, Ill.
Dynamic Air Engineering, Inc., Los Angeles, Calif.
Economy Electric Mfg. Co., Chicago, Ill.
Electrovent Fan & Mfg. Co., Chicago, Ill.
Emerson Electric Mfg. Co., The, St. Louis, Mo.
Fresh'nd-Aire Co., Chicago, Ill.
Garden City Fan Co., Chicago, Ill.
General Blower Co., Inc., Philadelphia, Pa.
General Electric Co., Air Conditioning and Commercial Refrigeration Divisions, Bloomfield, N. J.
Grand Rapids Blow Pipe & Dust Arrester Co., Grand Rapids, Mich.
Guth Co., Edwin F., St. Louis, Mo.
Hartzell Propeller Fan Co., Piqua, O.
Hirschman Co., W. F., Buffalo, N. Y.
Holtum Mfg. Co., Freeport, Ill.
Hunter Fan & Ventilating Co., Inc., Memphis, Tenn.
● Ilg Electric Ventilating Co., Chicago, Ill.
International Engineering, Inc., Dayton, O.
Jamieson Mfg. Co., Dallas, Tex.
Jeffrey Mfg. Co., Columbus, O.
● Johnson Fan & Blower Corp., Chicago, Ill.
Johnston Co., William W., Dayton, O.
Jordan & Co., Paul R., Indianapolis, Ind.
King Ventilating Co., Owatonna, Minn.
Kisco Boiler & Engineering Co., St. Louis, Mo.
Klee Co., Geo. B., Cincinnati, O.
La-Del Conveyor & Mfg. Co., New Philadelphia, O
Lau Blower Co., Dayton, O.
Lohman Co., Wm. J., Irvington, N. J.
Marathon Electric Mfg. Corp., Wausau, Wis.
● McCord Radiator & Mfg. Co., Detroit, Mich.
Meier Electric & Machine Co., Indianapolis, Ind.
Mountain States Equipment Co., Denver, Colo.
Myers Electric Co., Inc., Pittsburgh, Pa.
National Engineering & Mfg. Co., Kansas City, Mo.
● Nelson Corp., Herman, Moline, Ill.
New York Blower Co., Chicago, Ill.
Peerless Electric Co., Warren, O. (Disc)
Perkins & Son, Inc., B. F., Holyoke, Mass.
Phelps Mfg. Co., Little Rock, Ark.
Pritchard & Co., J. F., Kansas City, Mo.
Propellair, Inc., Springfield, O.
Reed Unit-Fans, Inc., New Orleans, La.
Reynolds Electric Co., Chicago, Ill.
Royal Air Conditioning Equipment Co., Alhambra, Calif
Schwitzer-Cummins Co., Indianapolis, Ind.
Scott-Newcomb, Inc., St. Louis, Mo.
Semco Mfg. Co., Nashville, Tenn.
Shreveport Engineering Co., Inc., Shreveport, La.
Signal Electric Mfg. Co., Menominee, Mich.
● Skinner Heating & Ventilating Co., Inc., Div. of St. Louis Bl Pipe & Heater Co., St. Louis, Mo.
South Bend Air Products Corp., South Bend, Ind.
Sturtevant Co., B. F., Boston, Mass.
Trade-Wind Motorfans, Inc., Los Angeles, Calif.
● Trane Co., The, La Crosse, Wis.
Truflo Fan Co., Harmony, Pa.
● United States Air Conditioning Corp., Minneapolis, Minn.
Utility Fan Corp., Los Angeles, Calif.
Victor Electric Products, Inc., Cincinnati, O.
Viking Air Conditioning Corp., Cleveland, O.
Water Cooling Equipment Corp., St. Louis, Mo.
Western Blower Co., Seattle, Wash.
Western Engineering & Mfg. Co., Los Angeles, Calif.
Wind-Way Fan & Ventilator Co., New Orleans, La.
● Wing Mfg. Co., L. J., New York, N. Y.

FEEDERS, CHEMICAL, PROPORTIONING

American Water Softener Co., Philadelphia, Pa.
Black-Sivalls & Bryson, Inc., Kansas City, Mo.
Elgin Softener Corp., Elgin, Ill.
Graver Tank & Mfg. Co., Inc., East Chicago, Ind.
Haering Co., Inc., D. W., Chicago, Ill.
Jeffrey Mfg. Co., Columbus, O.
Permutit Co., New York, N. Y.
● Stephens-Adamson Mfg. Co., Aurora, Ill.
Syntron Co., Homer City, Pa.
Wade Mfg. Co., Div. of Woodruff & Edwards, Inc., Elgin, Ill
Wallace & Tiernan Co., Inc., Newark, N. J.

FEEDERS, WATER, HEATING BOILER

Cash Valve Mfg. Co., A. W., Decatur, Ill.
Cissell Mfg. Co., W. M., Louisville, Ky.
Davis Regulator Co., Chicago, Ill.
Eclipse Fuel Engineering Co., Rockford, Ill.
● General Controls Co., Glendale, Cal.
Healy Ruff Co., St. Paul, Minn.
Johnson Corp., Three Rivers, Mich.
● Kieley & Mueller, Inc., North Bergen, N. J.
Kisco Boiler & Engineering Co., St. Louis, Mo.
● Maid-O'-Mist, Inc., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
● McDonnell & Miller, Chicago, Ill.
Mears-Kane-Ofeldt, Inc., Philadelphia, Pa.
Mueller Steam Specialty Co., Inc., Long Island City, N. Y.
Nason Co., Detroit, Mich.
Schaub Engineering Co., Fred H., Chicago, Ill.
Sterling Engineering & Mfg. Corp., Hyde Park, Mass.
Templeton Mfg. Co., Hyde Park, Mass.
Watts Regulator Co., Lawrence, Mass.
● Webster & Co., Warren, Camden, N. J.
Wright-Austin Co., Detroit, Mich.

FEEDWATER HEATERS

See Deaerators

FIBER PACKING

See Packing, Fiber

FIBER PIPE

See Pipe, Fiber

FILTER GAGES

See Gages, Air Filter

FILTERS, AIR, AUTOMATIC

● Air & Refrigeration Corp., New York, N. Y.
Air-Stream Filter Corp., St. Louis, Mo.

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● American Air Filter Co., Inc., Louisville, Ky.
Brauer Supply Co., A. G., St. Louis, Mo.
● Dollinger Corp., Rochester, N. Y.
Dracco Corp., Cleveland, O.
Farr Co., Los Angeles, Calif.

FILTERS, AIR, UNIT, CLEANABLE

● Air Devices, Inc., New York, N. Y.
Air Filter Engineering Co., Chicago, Ill.
● Air-Maze Corp., Cleveland, O.
Air-Stream Filter Corp., St. Louis, Mo.
● American Air Filter Co., Inc., Louisville, Ky.
Amirton Co., Inc., New York, N. Y.
Brauer Supply Co., A. G., St. Louis, Mo.
Chicago Filter Co., Joliet, Ill.
Coppus Engineering Corp., Worcester, Mass.
Davies Air Filter Corp., New York, N. Y.
● Detroit Lubricator Co., Detroit, Mich.
● Dollinger Corp., Rochester, N. Y.
Farr Co., Los Angeles, Calif.
Filters, Inc., Glendale, Calif.
● Filtrine Mfg. Co., Inc., Brooklyn, N. Y.
Hugo Mfg. Co., West Duluth, Minn.
Kauffman Air Conditioning Corp., St. Louis, Mo.
Kaye & MacDonald, Inc., West Orange, N. J.
Kleenaire Corp., Stevens Point, Wis.
● Research Products Corp., Madison, Wis.
Somers, Inc., H. J., Detroit, Mich.
Supreme Air Filter Co., New York, N. Y.
Tuttle Air Filter Co., Inc., Louisville, Ky.
Universal Air Filter Corp., Duluth, Minn.

FILTERS, AIR, UNIT, THROW-AWAY

● American Air Filter Co., Inc., Louisville, Ky.
Amirton Co., Inc., New York, N. Y.
Arcweld Mfg. Co., Inc., Seattle, Wash.
Blocksom & Co., Michigan City, Ind.
Chicago Filter Co., Joliet, Ill.
Davies Air Filter Corp., New York, N. Y.
● Detroit Lubricator Co., Detroit, Mich.
● Dollinger Corp., Rochester, N. Y.
Gehri Co., Tacoma, Wash.
Kleenaire Corp., Stevens Point, Wis.
● Owens-Corning Fiberglas Corp., Toledo, O.
● Research Products Corp., Madison, Wis.
Universal Air Filter Corp., Duluth, Minn.
Wilson & Co., Chicago, Ill.

FILTERS, ODOR

See Adsorbers, Odor

FILTERS, PIPE LINE

Adams Co., Inc., R. P., Buffalo, N. Y.
● Alco Valve Co., St. Louis, Mo.
American Locomotive Co., Alco Products Div., New York, N Y.
● Automatic Products Co., Milwaukee, Wis.
Bowser, Inc., Fort Wayne, Ind.
Cochrane Corp., Philadelphia, Pa.
Cuno Engineering Corp., Meriden, Conn.
● Dollinger Corp., Rochester, N. Y.
Elgin Softener Corp., Elgin, Ill.
● Filtrine Mfg. Co., Inc., Brooklyn, N. Y.
● Fisher Governor Co., Marshalltown, Ia.
● General Motors Corp., Moraine Products Div., Dayton, O.
Graver Tank & Mfg. Co., Inc., East Chicago, Ind.
● Hotstream Heater Co., Cleveland, O. (air)
Johnson Corp., Three Rivers, Mich.
Logan Engineering Co., Chicago, Ill.
Mason-Neilan Regulator Co., Boston, Mass.
Monmouth Products Co., Cleveland, O.
Newark Wire Cloth Co., Newark, N. J.
Norgren Co., C. A., Denver, Colo.
Permutit Co., New York, N. Y.
Refinite Corp., Omaha, Neb.
Rega Mfg. Co., Rochester, N. Y.
Ross Valve Mfg. Co., Inc., Troy, N. Y.
Scientific Instrument Co., Detroit, Mich.
Trerice Co., Detroit, Mich.
Weatherhead Co., Cleveland, O.
● Worthington Pump & Machinery Corp., Harrison, N. J.

FINNED TUBING

See Tubing, Finned

FIRE PUMPS

See Pumps, Fire

FITTINGS, BLOW PIPE

Allington & Curtis Mfg. Co., Saginaw, Mich.
Chicago Metal Mfg. Co., Chicago, Ill.
Cincinnati Sheet Metal & Roofing Co., Cincinnati, O.
Day Co., The, Minneapolis, Minn.
Falstrom Co., Passaic, N. J.
Goethel Sheet Metal Works, Alfred, Milwaukee, Wis.
Grand Rapids Blow Pipe & Dust Arrester Co., Grand Rapids, Mich.
Kirk & Blum Mfg. Co., Cincinnati, O.
Mahon Co., R. C., Detroit, Mich.
Peters-Dalton, Inc., Detroit, Mich.
Puhl & Hepper Mfg. Co., Inc., St. Louis, Mo.
Schmieg Industries, Detroit, Mich.
● Skinner Heating & Ventilating Co., Inc., Div. of St. Louis Blow Pipe & Heater Co., St. Louis, Mo.
Tiffin Eaves Trough Clamp Co., Tiffin, O.
United States Register Co., Battle Creek, Mich.
Western Blower Co., Seattle, Wash.
Winkler & Sons, Inc., A. E., Milwaukee, Wis.
Young & Bertke Co., Cincinnati, O.

FITTINGS, COPPER TUBE, COMPRESSION

● American Brass Co., Waterbury, Conn.
Chase Brass & Copper Co., Waterbury, Conn.
Commonwealth Brass Corp., Detroit, Mich.
Conklin Brass & Copper Co., Inc., T. E., New York, N. Y.
● Crane Co., Chicago, Ill.
Dresser Mfg. Co., Bradford, Pa.
Everhot Products Co., Chicago, Ill.
● Grinnell Co., Inc., Superseal Div., Providence, R. I.
Hays Mfg. Co., Erie, Pa.
Imperial Brass Mfg. Co., Chicago, Ill.
Kerotest Mfg. Co., Pittsburgh, Pa.
Northern Indiana Brass Co., Elkhart, Ind.
Packless Metal Products Corp., New Rochelle, N. Y. (Self-flaring)
Parker Appliance Co., Cleveland, O.

FITTINGS, COPPER TUBE, SOLDER

Acheson Mfg. Co., Rankin, Pa.
● American Brass Co., Waterbury, Conn.
Chase Brass & Copper Co., Waterbury, Conn.
Conklin Brass & Copper Co., Inc., T. E., New York, N. Y.
● Crane Co., Chicago, Ill.
Flagg & Co., Inc., Stanley G., Philadelphia, Pa.
Grabler Mfg. Co., Cleveland, O.
Mueller Brass Co., Port Huron, Mich.
Northern Indiana Brass Co., Elkhart, Ind.
Parker Appliance Co., Cleveland, O.
● Walworth Co., New York, N. Y. (Brazed)

FITTINGS, DRAINAGE, FIXED AIR BREAK

American Sterilizer Co., Erie, Pa.
Scanlan-Morris Co., Madison, Wis.
Semler Co., Jeannette, Pa.
Wade Mfg. Co., Div. of Woodruff & Edwards, Inc., Elgin, Ill.

FITTINGS, HOT WATER HEATING SYSTEMS, ONE PIPE

● Bell & Gossett Co., Morton Grove, Ill.
Kehm Corp., The, Chicago, Ill.
Semler Co., Jeannette, Pa.
Taco Heaters, Inc., New York, N. Y.
● Thrush & Co., H. A., Peru, Ind.
● Trane Co., The, La Crosse, Wis.
Triplex Heating Specialty Co., Peru, Ind.

FITTINGS, LINED

Alpha Metal & Rolling Mills, Inc., Brooklyn, N. Y.
American Hard Rubber Co., New York, N. Y. (Rubber)
● American Smelting & Refining Co., New York, N. Y.
Cement Lined Pipe Co., Lynn, Mass.
Goodrich Co., B. F., Akron, O. (Rubber)
Lead Lined Iron Pipe Co., Wakefield, Mass. (Lead and tin)
Luzerne Rubber Co., Trenton, N. J. (Hard rubber)
National Lead Co., New York, N. Y. (Lead)
Northern Indiana Brass Co., Elkhart, Ind. (Tinned)
Resisto Pipe & Valve Co., East Cambridge, Mass.
United States Rubber Co., New York, N. Y. (Rubber)

FITTINGS, PIPE, BRASS, SOLDER

Acheson Mfg. Co., Rankin, Pa.
● American Brass Co., Waterbury, Conn.
Chase Brass & Copper Co., Waterbury, Conn.
Conklin Brass & Copper Co., Inc., T. E., New York, N. Y.
● Crane Co., Chicago, Ill.
Downs-Smith Brass & Copper Co., New York, N. Y.
Flagg & Co., Inc., Stanley G., Philadelphia, Pa.
Mueller Brass Co., Port Huron, Mich.
Northern Indiana Brass Co., Elkhart, Ind.
Parker Appliance Co., Cleveland, O.
Union Metal Works, Chelsea, Mass.
● Walworth Co., New York, N. Y. (Brazed)

FITTINGS, PIPE, BRASS, THREADED

Acheson Mfg. Co., Rankin, Pa.
American Manganese Bronze Co., Philadelphia, Pa.
Belfield Co., H., Philadelphia, Pa.
Chase Brass & Copper Co., Waterbury, Conn.
Commonwealth Brass Corp., Detroit, Mich.
Conklin Brass & Copper Co., Inc., T. E., New York, N. Y.
● Crane Co., Chicago, Ill.
Downs-Smith Brass & Copper Co., New York, N. Y.
Flagg & Co., Inc., Stanley G., Philadelphia, Pa.
Grabler Mfg. Co., Cleveland, O.
● Grinnell Co., Inc., Providence, R. I.
Imperial Brass Mfg. Co., Chicago, Ill.

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Jarecki Mfg. Co., Erie, Pa.
● Kennedy Valve Mfg. Co., Elmira, N. Y.
Leavitt Machine Co., Orange, Mass.
Lunkenheimer Co., Cincinnati, O.
Newman Brothers, Inc., Cincinnati, O.
New York Brass Fdry., New York, N. Y.
Parker Appliance Co., Cleveland, O.
Penn Mfg. Corp. of Washington, Pa., Washington, Pa.
Phoenix Brass Fittings Corp., Irvington, N. J.
Ross Sprinkler Co., Pasadena, Calif.
Union Metal Wks., Chelsea, Mass.
● Walworth Co., New York, N. Y.
Ward Foundries, Inc., J. P., Blossburgh, Pa.

FITTINGS, PIPE, BRASS, WELDING

● Bonney Forge & Tool Wks., Allentown, Pa.
● Midwest Piping & Supply Co., Inc., St. Louis, Mo.
● Tube Turns, Louisville, Ky.
● Walworth Co., New York, N. Y. (Brazed)

FITTINGS, PIPE, BRONZE, BRAZED

● Crane Co., Chicago, Ill.
Flagg & Co., Inc., Stanley G., Philadelphia, Pa.
Kaltenthaler Co., H. J., Philadelphia, Pa.
Newman Brothers, Inc., Cincinnati, O.
Union Metal Works, Chelsea, Mass.
● Walworth Co., New York, N. Y.

FITTINGS, PIPE, CAST IRON, FLANGED

Alabama Pipe Co., Anniston, Ala.
American Cast Iron Pipe Co., Birmingham, Ala.
● Builders-Providence, Inc., Div. of Builders Iron Foundry, Providence, R. I.
Central Foundry Co., New York, N. Y.
Clow & Sons, James B., Chicago, Ill.
● Crane Co., Chicago, Ill.
Duriron Co., Inc., Dayton, O. (Acid resisting)
Eastern Foundry Co., Boyertown, Pa.
Frick Co., Waynesboro, Pa.
● Grinnell Co., Inc., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Jarecki Mfg. Co., Erie, Pa.
Kaltenthaler Co., H. J., Philadelphia, Pa.
● Kennedy Valve Mfg. Co., The, Elmira, N. Y.
Kuhns Bros. Co., Dayton, O.
Lynchburg Foundry Co., Lynchburg, Va.
Malleable Iron Fittings Co., Branford, Conn.
National Valve & Mfg. Co., Pittsburgh, Pa.
Pittsburgh Valve & Fittings Corp., Barberton, O.
Semler Co., Jeannette, Pa.
Stockham Pipe Fittings Co., Birmingham, Ala.
Straight Line Foundry & Machine Corp.; Direct Separator Div., The, Syracuse, N. Y.
United States Pipe & Foundry Co., Burlington, N. J.
● Walworth Co., New York, N. Y.
Warren Foundry & Pipe Corp., New York, N. Y.

FITTINGS, PIPE, CAST IRON, THREADED

Central Foundry Co., New York, N. Y.
Clow & Sons, James B., Chicago, Ill.
● Crane Co., Chicago, Ill.
Detroit Brass & Malleable Wks., Detroit, Mich.
Eastern Foundry Co., Boyertown, Pa.
Flagg & Co., Inc., Stanley G., Philadelphia, Pa.
Frick Co., Waynesboro, Pa.
Grabler Mfg. Co., Cleveland, O.
● Grinnell Co., Inc., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Jarecki Mfg. Co., Erie, Pa.
Kuhns Bros. Co., Dayton, O.
Malleable Iron Fittings Co., Branford, Conn.
Pittsburgh Valve & Fittings Corp., Barberton, O.
Ravena Iron Co., Ravena, N. Y.
Semler Co., Jeannette, Pa.
Somerville Iron Works, Somerville, N. J.
Stockham Pipe Fittings Co., Birmingham, Ala.
● Walworth Co., New York, N. Y.
Ward Foundries, Inc., J. P., Blossburgh, Pa.

FITTINGS, PIPE, COMPRESSION

● Crane Co., Chicago, Ill.
Dresser Mfg. Co., Bradford, Pa.

FITTINGS, PIPE, HARD RUBBER

American Hard Rubber Co., New York, N. Y.
Luzerne Rubber Co., Trenton, N. J.

FITTINGS, PIPE, LEAD

Alpha Metal & Rolling Mills, Inc., Brooklyn, N. Y.
● American Smelting & Refining Co., New York, N. Y.
Eagle-Picher Lead Co., Cincinnati, O.
Flemm Lead Co., Inc., Long Island City, N. Y.
Lead Lined Iron Pipe Co., Wakefield, Mass.
Lissberger & Son, Inc., Marks, Long Island City, N. Y.
National Lead Co., New York, N. Y.
Northwest Lead Co., Seattle, Wash.

FITTINGS, PIPE, MALLEABLE

● Crane Co., Chicago, Ill.
Detroit Brass & Malleable Wks., Detroit, Mich.
Flagg & Co., Inc., Stanley G., Philadelphia, Pa.
Grabler Mfg. Co., Cleveland, O.
● Grinnell Co., Inc., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Jarecki Mfg. Co., Erie, Pa.
● Kennedy Valve Mfg. Co., Elmira, N. Y.
Malleable Iron Fittings Co., Branford, Conn.
Pittsburgh Valve & Fittings Corp., Barberton, O.
Rhode Island Fittings Co., Hillsgrove, R. I.
Stockham Pipe Fittings Co., Birmingham, Ala.
Victaulic Co. of America, New York, N. Y.
● Walworth Co., New York, N. Y.
Ward Foundries, Inc., J. P., Blossburgh, Pa.

FITTINGS, PIPE, NICKEL AND NICKEL ALLOY

American Manganese Bronze Co., Philadelphia, Pa.
Cooper Alloy Foundry Co., Hillside, N. J.
● Crane Co., Chicago, Ill.
Duriron Co., Inc., Dayton, O.
Hasco Valve & Machine Co., Milwaukee, Wis.
International Nickel Co., New York, N. Y.
Parker Appliance Co., Cleveland, O.
● Tube Turns, Louisville, Ky.
Warren Foundry & Pipe Corp., New York, N. Y.

FITTINGS, PIPE, PLASTIC

Acadia Synthetic Products Div., Western Felt Works, Chicago Ill.
American Hard Rubber Co., New York, N. Y.
Commercial Plastics Co., Chicago, Ill.
Hodgman Rubber Co., Framingham, Mass.
Mills Corp., Elmer E., Chicago, Ill.
North Penn Co., New York, N. Y.
United States Stoneware Co., New York, N. Y.
Yardley Plastics Co., Columbus, O.

FITTINGS, PIPE, STEEL, FLANGED

Alloy Steel Products Co., Linden, N. J. (Stainless steel)
● American Rolling Mill Co., The, Middletown, O.
● Crane Co., Chicago, Ill.
Frick Co., Waynesboro, Pa.
Hasco Valve & Machine Co., Milwaukee, Wis. (Stainless steel only)
National Valve & Mfg. Co., Pittsburgh, Pa.
● Reading-Pratt & Cady Div., American Chain & Cable Co., Inc., Reading, Pa.
Ryerson & Son, Inc., Jos. T., Chicago, Ill.
Semet-Solvay Engrg. Corp., New York, N. Y.
Vogt Machine Co., Henry, Louisville, Ky.
● Walworth Co., New York, N. Y.
Watson-Stillman Co., Roselle, N. J.

FITTINGS, PIPE, STEEL, FORGED, THREADED

Catawissa Valve & Fittings Co., Catawissa, Pa.
● Crane Co., Chicago, Ill.
● Henry Valve Co., Chicago, Ill.
Larkin Packer Co., St. Louis, Mo.
Vogt Machine Co., Henry, Louisville, Ky.
● Walworth Co., New York, N. Y.
Watson-Stillman Co., Roselle, N. J.

FITTINGS, PIPE, STEEL, SOCKET WELD

Catawissa Valve & Fittings Co., Catawissa, Pa.
● Crane Co., Chicago, Ill.
Vogt Machine Co., Henry, Louisville, Ky.
● Walworth Co., New York, N. Y.
Watson-Stillman Co., Roselle, N. J.

FITTINGS, PIPE, STEEL, THREADED

Alloy Steel Products Co., Linden, N. J. (Stainless steel)
Catawissa Valve & Fittings Co., Catawissa, Pa.
Colonial Alloys Co., Metals Div., Philadelphia, Pa. (Stainless)
● Crane Co., Chicago, Ill.
Frick Co., Waynesboro, Pa.
Gustin Bacon Mfg. Co., Kansas City, Mo.
Harrisburg Steel Corp., Harrisburg, Pa.
Hasco Valve & Machine Co., Milwaukee, Wis. (Stainless steel only)
Penn Mfg. Corp. of Washington, Pa., Washington, Pa.
● Reading-Pratt & Cady Div., American Chain & Cable Co., Inc., Reading, Pa.
Vogt Machine Co., Henry, Louisville, Ky.
● Walworth Co., New York, N. Y.
Watson-Stillman Co., Roselle, N. J.

FITTINGS, PIPE, STEEL, WELDING

● American Rolling Mill Co., The, Middletown, O.
● Bonney Forge & Tool Wks., Allentown, Pa.
Catawissa Valve & Fittings Co., Catawissa, Pa.
● Crane Co., Chicago, Ill.
● Grinnell Co., Inc., Providence, R. I.
Gustin Bacon Mfg. Co., Kansas City, Mo.
Larkin Packer Co., St. Louis, Mo.

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- ● Midwest Piping & Supply Co., Inc., St. Louis, Mo.
- National Valve & Mfg. Co., Pittsburgh, Pa.
- Oil Well Supply Co., Oil City, Pa.
- Penn Mfg. Corp. of Washington, Pa., Washington, Pa.
- Semet-Solvay Engineering Corp., New York, N. Y.
- ● Taylor Forge & Pipe Wks., Chicago, Ill.
- ● Tube Turns, Louisville, Ky.
- Vogt Machine Co., Henry, Louisville, Ky.
- ● Walworth Co., New York, N. Y.
- Wedge Protectors, Inc., Cleveland, O. (Chill rings)

FITTINGS, PIPE, WROUGHT IRON, WELDING

- ● Bonney Forge & Tool Wks., Allentown, Pa.
- ● Grinnell Co., Inc., Providence, R. I.
- Gustin Bacon Mfg. Co., Kansas City, Mo.
- ● Midwest Piping & Supply Co., Inc., St. Louis, Mo.
- National Valve & Mfg. Co., Pittsburgh, Pa.
- Penn Mfg. Corp. of Washington, Pa., Washington, Pa.
- ● Taylor Forge & Pipe Wks., Chicago, Ill.
- ● Tube Turns, Louisville, Ky.

FITTINGS, REFRIGERATION

- American Injector Co., Detroit, Mich.
- ● Baker Ice Machine Co., Inc., Omaha, Nebr.
- Chase Brass & Copper Co., Waterbury, Conn.
- Commonwealth Brass Corp., Detroit, Mich.
- ● Crane Co., Chicago, Ill.
- Dersch, Gesswein & Neuert, Inc., Chicago, Ill.
- Downs-Smith Brass & Copper Co., New York, N. Y.
- Frick Co., Waynesboro, Pa.
- ● Henry Valve Co., Chicago, Ill.
- Imperial Brass Mfg. Co., Chicago, Ill.
- Kerotest Mfg. Co., Pittsburgh, Pa.
- Mueller Brass Co., Port Huron, Mich.
- Northern Indiana Brass Co., Elkhart, Ind.
- Parker Appliance Co., Cleveland, O.
- Superior Valve & Fittings Co., Pittsburgh, Pa.
- Vilter Mfg. Co., Milwaukee, Wis.
- Vogt Machine Co., Henry, Louisville, Ky.
- ● Walworth Co., New York, N. Y.
- Watson-Stillman Co., Roselle, N. J.
- Weatherhead Co., Cleveland, O.
- Wittenmeier Machinery Co., Chicago, Ill.
- ● Worthington Pump & Machinery Corp., Air Conditioning and Refrigeration Div., Harrison, N. J.
- X L Refrigerating Co., Inc., Chicago, Ill.
- York Corp., York, Pa.

FLANGE BOLTS

See Bolts and Studs, Flange

FLANGES, PIPE, ALLOY STEEL

- Cooper Alloy Foundry Co., Hillside, N. J.
- ● Crane Co., Chicago, Ill.
- Hasco Valve & Machine Co., Milwaukee, Wis.
- Kopperman & Sons, Joseph, Philadelphia, Pa.
- Ladish Drop Forge Co., Fittings Div., Cudahy, Wis.
- Limbert & Co., Geo. B., Chicago, Ill.
- ● Midwest Piping & Supply Co., Inc., St. Louis, Mo.
- Steele Improvement & Forge Co., Cleveland, O.
- ● Taylor Forge & Pipe Works, Chicago, Ill.

FLANGES, PIPE, BRASS

- Acheson Mfg. Co., Rankin, Pa.
- Chase Brass & Copper Co., Waterbury, Conn.
- ● Crane Co., Chicago, Ill.
- Flagg & Co, Inc., Stanley G., Philadelphia, Pa.
- Jarecki Mfg. Co., Erie, Pa.
- Kaltenthaler Co., H. J., Philadelphia, Pa.
- Kopperman & Sons, Joseph, Philadelphia, Pa.
- Limbert & Co., Geo. B., Chicago, Ill.
- Newman Brothers, Inc., Cincinnati, O.
- Union Metal Works, Chelsea, Mass.
- ● Walworth Co., New York, N. Y.

FLANGES, PIPE, CAST IRON

- ● Baker Ice Machine Co., Inc., Omaha, Nebr.
- Clow & Sons, James B., Chicago, Ill.
- ● Crane Co., Chicago, Ill.
- Flagg & Co, Inc., Stanley G., Philadelphia, Pa.
- ● Grinnell Co., Inc., Providence, R. I.
- Illinois Malleable Iron Co., Chicago, Ill.
- Jarecki Mfg. Co., Erie, Pa.
- Kaltenthaler Co., H. J., Philadelphia, Pa.
- ● Kennedy Valve Mfg. Co., The, Elmira, N. Y.
- Kopperman & Sons, Joseph, Philadelphia, Pa.
- Kuhns Bros. Co., Dayton, O.
- Limbert & Co., Geo. B., Chicago, Ill.
- Lynchburg Foundry Co., Lynchburg, Va.
- Pittsburgh Valve & Fittings Corp., Barberton, O.
- Ravena Iron Co., Ravena, N. Y.
- Semler Co, Jeannette, Pa.
- Stockham Pipe Fittings Co., Birmingham, Ala.
- Straight Line Foundry & Machine Corp., Direct Separator Div., Syracuse, N. Y.
- ● Walworth Co., New York, N. Y.
- Ward Foundries, Inc., J. P., Blossburgh, Pa.
- Warren Foundry & Pipe Corp., New York, N. Y.

FLANGES, PIPE, MALLEABLE IRON

- ● Crane Co., Chicago, Ill.
- Flagg & Co, Inc., Stanley G., Philadelphia, Pa.
- ● Grinnell Co., Inc., Providence, R. I.
- Jarecki Mfg. Co., Erie, Pa.
- ● Kennedy Valve Mfg. Co., The, Elmira, N. Y.
- Kopperman & Sons, Joseph, Philadelphia, Pa.
- Limbert & Co., Geo. B., Chicago, Ill.
- Pittsburgh Valve & Fittings Corp., Barberton, O.
- Rhode Island Fittings Co., Hillsgrove, R. I.
- Stockham Pipe Fittings Co., Birmingham, Ala.
- ● Walworth Co., New York, N. Y.
- Ward Foundries, Inc., J. P., Blossburgh, Pa.

FLANGES, PIPE, STEEL

- ● American Rolling Mill Co., The, Middletown, O.
- ● Crane Co., Chicago, Ill.
- ● Flori Pipe Co., The, St. Louis, Mo.
- Harrisburg Steel Corp., Harrisburg, Pa.
- Kopperman & Sons, Joseph, Philadelphia, Pa.
- Ladish Drop Forge Co., Fittings Div., Cudahy, Wis.
- Limbert & Co., Geo. B., Chicago, Ill.
- ● Midwest Piping & Supply Co., Inc., St. Louis, Mo.
- National Valve & Mfg. Co., Pittsburgh, Pa.
- Naylor Pipe Co., Chicago, Ill.
- Pennsylvania Forge Co., Philadelphia, Pa.
- Pittsburgh Piping & Equipment Co., Pittsburgh, Pa.
- Power Piping Div., Blaw Knox Co., Pittsburgh, Pa.
- Semet-Solvay Engineering Corp., New York, N. Y.
- ● Taylor Forge & Pipe Works, Chicago, Ill.
- ● Tube Turns, Louisville, Ky.
- Union Metal Works, Chelsea, Mass.
- Vogt Machine Co., Henry, Louisville, Ky.
- ● Walworth Co., New York, N. Y.

FLANGES, PIPE, WELDING

- ● American Rolling Mill Co., The, Middletown, O.
- ● Crane Co., Chicago, Ill.
- ● Flori Pipe Co., The, St. Louis, Mo.
- Ladish Drop Forge Co., Fittings Div., Cudahy, Wis.
- Limbert & Co., Geo. B., Chicago, Ill.
- ● Midwest Piping & Supply Co., Inc., St. Louis, Mo.
- National Valve & Mfg. Co., Pittsburgh, Pa.
- ● Taylor Forge & Pipe Works, Chicago, Ill.
- ● Tube Turns, Louisville, Ky.
- Union Metal Works, Chelsea, Mass.
- Vogt Machine Co., Henry, Louisville, Ky.
- ● Walworth Co., New York, N. Y.

FLEXIBLE COUPLINGS

See Couplings, Flexible

FLEXIBLE DUCT CONNECTIONS

See Connections, Duct, Flexible

FLEXIBLE METAL HOSE

See Hose, Metal, for Eliminating Compressor Vibration

FLOAT SWITCHES

See Switches, Float

FLOAT VALVES

See Valves, Float

FLOATS, STEAM TRAP, ETC.

- Clark Controller Co., Cleveland, O.
- ● Crane Co., Chicago, Ill.
- Cryer Trap & Valve Co., Inc., New York, N. Y.
- Hanlon-Waters, Inc., Tulsa, Okla.
- Harris & Co., Arthur, Chicago, Ill.
- Hercules Float Wks., Springfield, Mass.
- ● Hoffman Specialty Co., Indianapolis, Ind.
- Huyette Co., Inc., Paul B., Philadelphia, Pa.
- ● Kieley & Mueller, Inc., North Bergen, N. J.
- McAlear Mfg. Co., Chicago, Ill.
- Milwaukee Valve Co., Milwaukee, Wis.
- Naugatuck Mfg. Co., Union City, Conn.
- Nicholson & Co., W. H., Wilkes-Barre, Pa.
- ● Reading-Pratt & Cady Div., American Chain & Cable Co., Inc Reading, Pa.
- Reichert Float & Mfg. Co., Toledo, O.
- Reliance Gauge Column Co., Cleveland, O.
- Sterling Engineering & Mfg. Corp., Hyde Park, Mass.
- Strong, Carlisle & Hammond Co., Cleveland, O.
- Templeton Mfg. Co., Hyde Park, Mass.
- ● Trane Co., The, La Crosse, Wis.
- Vapor Specialty Co., New York, N. Y.
- Watson & McDaniel Co., Philadelphia, Pa.
- Williams Gauge Co., Pittsburgh, Pa.
- Wright-Austin Co., Detroit, Mich.

FLOOR AND CEILING PLATES

See Plates, Floor and Ceiling

FLOW CONTROL VALVES

See Valves, Flow Control

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FLOW METERS
See Meters, Flow

FLOW SWITCHES
See Switches, Flow

FORGED STEEL VALVES
See Valves, Forged Steel

FUEL ECONOMIZERS
See Economizers, Fuel

FURNACES, WARM AIR, FOR INDUSTRIAL AND LARGE BUILDING HEATING

● Airtherm Mfg. Co., St. Louis, Mo.
American Foundry & Furnace Co., Bloomington, Ill.
American Furnace Co., St. Louis, Mo.
Arcweld Mfg. Co., Inc., Seattle, Wash.
Atlas Heating & Ventilating Co., Ltd., San Francisco, Calif.
Beck Engineering Combustion Kompany, St. Louis, Mo.
● Bryant Heater Co., The, Cleveland, O.
Campbell Heating Co., Des Moines, Ia.
Campbell Heating Co., E. K., Kansas City, Mo.
Henry Furnace Co., The, Medina, O.
Jackson & Church Co., Saginaw, Mich.
Lee Engineering Co., Youngstown, O.
Lennox Furnace Co., Marshalltown, Ia., Syracuse, N. Y., and Columbus, O.
Magirl Foundry & Furnace Wks., P. H., Bloomington, Ill.
Majestic Co., Huntington, Ind.
Mayflower Air-Conditioners, Inc., St. Paul, Minn.
McCann Furnace Co., Cleveland, O.
McPherson Furnace & Supply Co., Portland, Ore.
Meyer Furnace Co., The, Peoria, Ill.
Moncrief Furnace Co., Atlanta, Ga.
Montag Stove & Furnace Wks., Portland, Ore.
● Mueller Furnace Co., L. J., Milwaukee, Wis.
● National Heater Co., Minneapolis, Minn.
National Mfg. & Engineering Co., Detroit, Mich.
Northwest Stove & Furnace Wks., Inc., Portland, Ore.
Palmer Mfg. Corp., Phoenix, Ariz.
Payne Furnace & Supply Co., Inc., Beverly Hills, Calif.
Rosebraugh Co., W. W., Salem, Ore.
Sonner Burner Co., Winfield, Kans.
Stainless & Steel Products Co., St. Paul, Minn.
Surface Combustion, Toledo, O.
XXth Century Heating & Ventilating Co., Akron, O.
Western Furnaces, Inc., Tacoma, Wash.
● Zink Co., John, Tulsa, Okla.

FUSIBLE LINKS
See Links, Fusible

GAGE GLASSES
See Glasses, Gage

GAGE TESTERS
See Testers, Gage, Dead Weight

GAGES, AIR FILTER

Air Filter Engineering Co., Chicago, Ill.
Defender Automatic Regulator Co., St. Louis, Mo.
Detroit Air Meter Co., Detroit, Mich.
Dwyer Mfg. Co., F. W., Chicago, Ill.
Ellison Draft Gage Co., Chicago, Ill.
● Hays Corp., Michigan City, Ind.
Herbusch Corp., The, St. Louis, Mo. (Warning device)
Hill, E. Vernon, Chicago, Ill.
● Hotstream Heater Co., Cleveland, O.
Huyette Co., Inc., Paul B., Philadelphia, Pa.
Meriam Co., The, Cleveland, O.
Uehling Instrument Co., Paterson, N. J.

GAGES, INDICATING, DRAFT

Ashcroft Gauge Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn.
Bacharach Industrial Instrument Co., Pittsburgh, Pa.
Bailey Meter Co., Cleveland, O.
Brown Instrument Co., Div. of Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.
Cole-Sullivan Engineering Co., Minneapolis, Minn.
Defender Automatic Regulator Co., St. Louis, Mo.
Detroit Air Meter Co., Detroit, Mich.
Dwyer Mfg. Co., F. W., Chicago, Ill.
Ellison Draft Gage Co., Chicago, Ill.
Foxboro Co., Foxboro, Mass.
● Hays Corp., Michigan City, Ind.
Hill, E. Vernon, Chicago, Ill.
● Hotstream Heater Co., Cleveland, O.
Huyette Co., Inc., Paul B., Philadelphia, Pa.
Meriam Co., The, Cleveland, O.
Moeller Instrument Co., Richmond Hill, N. Y.
Precision Thermometer & Instrument Co., Philadelphia, Pa.
Preferred Utilities Co., Inc., New York, N. Y.
Republic Flow Meters Co., Chicago, Ill.
Scientific Instrument Co., Detroit, Mich.
Uehling Instrument Co., Paterson, N. J.

GAGES, INDICATING, PRESSURE

Ashcroft Gauge Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn.
Ashton Valve Co., Cambridge, Mass.
Bacharach Industrial Instrument Co., Pittsburgh, Pa.
Bailey Meter Co., Cleveland, O.
Belfield Co., H., Philadelphia, Pa.
Bristol Co., Waterbury, Conn.
Brown Instrument Co., Div. of Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.
Certified Gauge & Instrument Corp., Long Island City, N. Y.
Defender Automatic Regulator Co., St. Louis, Mo.
Detroit Brass & Malleable Wks., Detroit, Mich.
Electric Auto-Lite Co., Moto Meter Gauge & Equipment Div., La Crosse, Wis.
Foxboro Co., Foxboro, Mass.
● Hays Corp., Michigan City, Ind.
Hill, E. Vernon, Chicago, Ill.
● Hotstream Heater Co., Cleveland, O.
Huyette Co., Inc., Paul B., Philadelphia, Pa.
Imperial Brass Mfg. Co., Chicago, Ill.
● Leeds & Northrup Co., Philadelphia, Pa.
Lonergan Co., J. E., Philadelphia, Pa.
Marsh Corp., Jas. P., Chicago, Ill.
Marshalltown Mfg. Co., Marshalltown, Ia.
● Mercoid Corp., Chicago, Ill.
Meriam Co., The, Cleveland, O.
Moeller Instrument Co., Richmond Hill, N. Y.
Mouat Vapor Heating Co., The, Cleveland, O.
Norgren Co., C. A., Denver, Colo.
Pierce Butler Radiator Corp., Syracuse, N. Y.
Precision Thermometer & Instrument Co., Philadelphia, Pa.
Preferred Utilities Co., Inc., New York, N. Y.
Republic Flow Meters Co., Chicago, Ill.
Rochester Mfg. Co., Rochester, N. Y.
Scientific Instrument Co., Detroit, Mich.
Taylor Instrument Companies, Rochester, N. Y.
● Thrush & Co., H. A., Peru, Ind.
● Trane Co., The, La Crosse, Wis.
Trerice Co., H. O., Detroit, Mich.
Triplex Heating Specialty Co., Peru, Ind.
Uehling Instrument Co., Paterson, N. J.
● United States Gauge Co., New York, N. Y.
Wheelco Instruments Co., Chicago, Ill.

GAGES, INDICATING, VACUUM

American Schaeffer & Budenberg Instrument Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn.
Ashton Valve Co., Cambridge, Mass.
Bacharach Industrial Instrument Co., Pittsburgh, Pa.
Bailey Meter Co., Cleveland, O.
Belfield Co., H., Philadelphia, Pa.
Bristol Co., Waterbury, Conn.
Brown Instrument Co., Div. of Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.
Certified Gauge & Instrument Corp., Long Island City, N. Y.
Defender Automatic Regulator Co., St. Louis, Mo.
Electric Auto-Lite Co., Moto Meter Gauge & Equipment Div., La Crosse, Wis.
Foxboro Co., Foxboro, Mass.
● Hays Corp., Michigan City, Ind.
● Hoffman Specialty Co., Indianapolis, Ind.
Huyette Co., Inc., Paul B., Philadelphia, Pa.
Imperial Brass Mfg. Co., Chicago, Ill.
Lonergan Co., J. E., Philadelphia, Pa.
Marsh Corp., Jas. P., Chicago, Ill.
Marshalltown Mfg. Co., Marshalltown, Ia.
● Mercoid Corp., Chicago, Ill.
Meriam Co., The, Cleveland, O.
Moeller Instrument Co., Richmond Hill, N. Y.
Mouat Vapor Heating Co., The, Cleveland, O.
Precision Thermometer & Instrument Co., Philadelphia, Pa.
Preferred Utilities Co., Inc., New York, N. Y.
Republic Flow Meters Co., Chicago, Ill.
Rochester Mfg. Co., Rochester, N. Y.
Scientific Instrument Co., Detroit, Mich.
Taylor Instrument Companies, Rochester, N. Y.
● Trane Co., The, La Crosse, Wis.
Trerice Co., H. O., Detroit, Mich.
Uehling Instrument Co., Paterson, N. J.
● United States Gauge Co., New York, N. Y.

GAGES, LIQUID LEVEL

Alloy Steel Products Co., Linden, N. J. (Stainless steel)
American Injector Co., Detroit, Mich.
Bacharach Industrial Instrument Co., Pittsburgh, Pa.
Bordo Co., Inc., L. J., Glenside, Pa.
Boston Auto Gage Co., Pittsfield, Mass.
Bristol Co., Waterbury, Conn.
Brown Instrument Co., Div. of Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.
● Builders-Providence, Inc., Div. of Builders Iron Foundry, Providence, R. I.
Caldwell Co., W. E., Louisville, Ky.
Defender Automatic Regulator Co., St. Louis, Mo.
● Detroit Lubricator Co., Detroit, Mich.
Diamond Power Specialty Corp., Detroit, Mich.
Foxboro Co., Foxboro, Mass.

● Advertisement in this issue. See Index to Advertisers, page 322.

Frick Co., Waynesboro, Pa.
Hanlon-Waters, Inc., Tulsa, Okla.
● Hays Corp., Michigan City, Ind.
Huyette Co., Inc., Paul B., Philadelphia, Pa.
Keckley Co., O. C., Chicago, Ill.
King Engineering Corp., Ann Arbor, Mich.
Klingerit, Inc., New York, N. Y.
Krueger Sentry Gauge Co., Green Bay, Wis.
● Leeds & Northrup Co., Philadelphia, Pa.
Liquidometer Corp., Long Island City, N. Y.
Lonergan Co., J. E., Philadelphia, Pa.
Lunkenheimer Co., Cincinnati, O.
Meriam Co., The, Cleveland, O.
Morey & Jones, Ltd., Los Angeles, Calif.
Nason Co., Detroit, Mich.
Penberthy Injector Co., Detroit, Mich.
Petrometer Corp., Long Island City, N. Y.
Powell Co., Wm., Cincinnati, O.
Reliance Gauge Column Co., Cleveland, O.
Republic Flow Meters Co., Chicago, Ill.
Rochester Mfg. Co., Rochester, N. Y.
Schaub Engineering Co., Fred H., Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.
Scientific Instrument Co., Detroit, Mich.
Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
Taylor Instrument Companies, Rochester, N. Y.
Techtmann Industries, Inc., Milwaukee, Wis.
Trimount Instrument Co., Chicago, Ill.
Uehling Instrument Co., Paterson, N. J.
● United States Gauge Co., New York, N. Y.
Viking Pump Co., Cedar Falls, Ia.
Williams Gauge Co., Pittsburgh, Pa. (Water)
Wright-Austin Co., Detroit, Mich.
● Yarnall-Waring Co., Philadelphia, Pa.

GALVANIZED SHEETS

See Sheets, Steel, Galvanized

GALVANNEALED SHEETS

See Sheets, Steel, Galvannealed

GAS BURNERS

See Burners, Gas

GAS ENGINES

See Engines, Gas

GAS FIRED RADIATORS

See Radiators, Gas Fired

GAS PRESSURE REGULATORS

See Regulators, Pressure, Gas

GAS VOLUME METERS

See Meters, Volume, Air and Gas

GASKETS

Akron Metallic Gasket Co., Akron, O. (Metal & metal asbestos)
Alpha Metal & Rolling Mills, Inc., Brooklyn, N. Y.
● American Smelting & Refining Co., New York, N. Y.
Anchor Packing Co., Philadelphia, Pa. (Asbestos)
Armstrong Cork Co., Lancaster, Pa. (Cork & cork composition)
Azor Corp., Irvington, N. J. (Spiral wound)
Belmont Packing & Rubber Co., Philadelphia, Pa.
Belmont Smelting & Refining Works, Inc., Brooklyn, N. Y. (Lead)
Chase Brass & Copper Co., Waterbury, Conn. (Brass)
Chicago-Wilcox Mfg. Co., Chicago, Ill.
Clow & Sons, James B., Chicago, Ill.
Continental Diamond Fibre Co., Newark, Del.
Continental Rubber Wks., Erie, Pa.
● Crane Co., Chicago, Ill.
Crane Packing Co., Chicago, Ill.
Darcoid Co., Inc., New York, N. Y. (Asbestos)
Durabla Mfg. Co., New York, N. Y. (Asbestos fibre)
Ehret Magnesia Mfg. Co., Valley Forge, Pa.
Endura Mfg. Corp., Quakertown, Pa. (Paper, fibre)
Excelsior Leather Washer Mfg. Co., Rockford, Ill.
Felt Products Mfg. Co., Chicago, Ill. (Heat and oil resisting)
Felters Co., Inc., Boston, Mass.
Flexatalic Gasket Co., Camden, N. J. (Metal, asbestos)
Flexlock Corp., Akron, O.
Frick Co., Waynesboro, Pa.
Garlock Packing Co., Palmyra, N. Y. (Rubber, asbestos, fibre, semi-metallic)
Gates Rubber Co., The, Denver, Colo.
Gatke Corp., Chicago, Ill.
Goetze Gasket & Packing Co., Inc., New Brunswick, N. J.
Goodrich Co., B. F., Akron, O.
● Grant Wilson, Inc., Chicago, Ill. (Asbestos)
Graton & Knight Co., Worcester, Mass. (Leather)
Greene, Tweed & Co., New York, N. Y.
Houghton & Co., E. F., Philadelphia, Pa. (Leather)
● Jenkins Bros., New York, N. Y. (Ring asbestos or rubber sheet)
Johns-Manville, New York, N. Y.
Keasbey & Mattison Co., Ambler, Pa. (Asbestos)
Klingerit, Inc., New York, N. Y.
Linear Packing & Rubber Co., Inc., Philadelphia, Pa.
Manhattan Rubber Mfg., Div. of Raybestos-Manhattan, Inc., Passaic, N. J.
Metallo Gasket Co., New Brunswick, N. J. (Metal, metal asbestos)
Mitchell & Smith, Inc., Detroit, Mich. (Cork)
● Mortell Co., J. W., Kankakee, Ill.
National Engineering Products, Inc., Washington, D. C. (Plastic)
National Lead Co., New York, N. Y.
Pacific States Felt & Mfg. Co., Inc., San Francisco, Calif.
Quaker Rubber Corp., Philadelphia, Pa.
Ruberoid Co., New York, N. Y. (Asbestos)
Schieren Co., Chas. A., New York, N. Y.
Smooth-On Mfg. Co., Jersey City, N. J. (Corrugated iron)
Steel Improvement & Forge Co., Cleveland, O.
Stokes Rubber Co., Jos., Trenton, N. J. (Hard rubber)
Technical Ply-Woods, Chicago, Ill.
Thermoid Rubber, Div. of Thermoid Co., Trenton, N. J.
Union Asbestos & Rubber Co., Cicero, Ill.
United States Rubber Co., New York, N. Y. (Rubber, asbestos)
United States Stoneware Co., New York, N. Y.
Vibration Engineering Co., The, New York, N. Y. (cork)
Werner Co., Inc., R. D., New York, N. Y.
Western Felt Wks., Chicago, Ill. (Felt)
● Wilson, Inc., Grant, Chicago, Ill. (Asbestos)

GASOLINE FIRED HEATERS (for aircraft)

See Heaters, Gasoline Fired

GATE VALVES

See Valves, Gate

GATES, BLAST

Allington & Curtis Mfg. Co., Saginaw, Mich.
Berger Bros. Co., Philadelphia, Pa.
Blower Application Co., Milwaukee, Wis.
● Buffalo Forge Co., Buffalo, N. Y.
Champion Blower & Forge Co., Lancaster, Pa.
● Clarage Fan Co., Kalamazoo, Mich.
Day Co., The, Minneapolis, Minn.
Goethel Sheet Metal Works, Alfred, Milwaukee, Wis.
Grand Rapids Blow Pipe & Dust Arrester Co., Grand Rapids, Mich.
Kirk & Blum Mfg. Co., Cincinnati, O.
Maysteel Products, Inc., Mayville, Wis.
Puhl & Hepper Mfg. Co., Inc., St. Louis, Mo.
● R-S Products Corp., Philadelphia, Pa.
Spencer Turbine Co., Hartford, Conn.
Sturtevant Co., B. F., Boston, Mass.
Western Blower Co., Seattle, Wash.
Winkler & Sons, Inc., A. E., Milwaukee, Wis.

GLASS PIPE

See Pipe, Glass

GLASSES, GAGE

Bache, Semon & Co., New York, N. Y.
Corning Glass Works, Corning, N. Y.
● Crane Co., Chicago, Ill.
Durabla Mfg. Co., New York, N. Y.
Electric Auto-Lite Co., Moto Meter Gauge & Equipment Div., La Crosse, Wis.
Fischer & Porter Co., Hatboro, Pa.
● Jenkins Bros., New York, N. Y.
Klingerit, Inc., New York, N. Y.
Libbey-Owens Ford Glass Co., Toledo, O.
Lunkenheimer Co., Cincinnati, O.
Powell Co., Wm., Cincinnati, O.

GLASSES, SIGHT, FOR PIPE LINES

Bowser, Inc., Fort Wayne, Ind.
Cochrane Corp., Philadelphia, Pa.
Corning Glass Works, Corning, N. Y.
Imperial Brass Mfg. Co., Chicago, Ill.
Libbey-Owens Ford Glass Co., Toledo, O.
Superior Valve & Fittings Co., Pittsburgh, Pa.
Weatherhead Co., Cleveland, O.

GLOBE VALVES

See Valves, Globe

GOVERNORS, PUMP

Atlas Valve Co., Inc., Newark, N. J.
Boylston Steam Specialty Co., Chicago, Ill.
Burrows Mfg. Co., F. A., York, Pa.
● Cash Co., A. W., Decatur, Ill.
Davis Regulator Co., Chicago, Ill.
Defender Automatic Regulator Co., St. Louis, Mo.
● Fisher Governor Co., Marshalltown, Ia.
Foster Engineering Co., Newark, N. J.
Gardner-Denver Co., Quincy, Ill.
Hagan Corp., Pittsburgh, Pa.
Hanlon-Waters, Inc., Tulsa, Okla.
Jarecki Mfg. Co., Erie, Pa.
Keckley Co., O. C., Chicago, Ill.
● Kieley & Mueller, Inc., North Bergen, N. J.

Klipfel Mfg. Co., Chicago, Ill.
Leslie Co., Lyndhurst, N. J.
Locke Regulator Co., Salem, Mass.
Mason-Neilan Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Mueller Co., Decatur, Ill.
Mueller Steam Specialty Co., Inc., Long Island City, N. Y.
Northern Equipment Co., Erie, Pa.
● Reading-Pratt & Cady Div., American Chain & Cable Co., Inc., Reading, Pa.
Ruggles-Klingemann Mfg. Co., Salem, Mass.
Sampsel Time Control, Inc., Spring Valley, Ill.
Schade Valve Mfg. Co., Philadelphia, Pa.
Spence Engineering Co., Inc., Walden, N. Y.
Squires Co., C. E., Cleveland, O.
Staples & Pfeiffer, Ltd., San Francisco, Calif.
Strong, Carlisle & Hammond Co., Cleveland, O.
Swartwout Co., Cleveland, O.
Watson & McDaniel Co., Philadelphia, Pa.
Watts Regulator Co., Lawrence, Mass.
● Webster & Co., Warren, Camden, N. J.
Williams Gauge Co., Pittsburgh, Pa.
Wright-Austin Co., Detroit, Mich.

GRILLES

See also Diffusers; Panels, Perforated, for Air Diffusion; Registers

Acme Tin Plate & Roofing Supply Co., Philadelphia, Pa.
Air Control Products, Inc., Coopersville, Mich.
● Air Devices, Inc., New York, N. Y.
AirO-Fin Register Co., Detroit, Mich.
American Foundry & Furnace Co., Bloomington, Ill.
American Warming & Ventilating Co., Toledo, O.
● Auer Register Co., Cleveland, O.
● Barber-Colman Co., Rockford, Ill.
Beckley Perforating Co., Garwood, N. J.
Best Register Co., Milwaukee, Wis.
Central Wire & Iron Works, Des Moines, Ia.
Char-Gale Mfg. Co., Minneapolis, Minn.
Crown Iron Works, Minneapolis, Minn.
Davies Air Filter Corp., New York, N. Y.
Decatur Iron & Steel Co., Decatur, Ala.
Diamond Mfg. Co., Wyoming, Pa.
Empire Ventilation Equipment Co., Long Island City, N. Y.
Erdle Perforating Co., Rochester, N. Y.
Gillian Mfg. Co., Detroit, Mich.
Harrington & King Perforating Co., Chicago, Ill.
Hart & Cooley Mfg. Co., Holland, Mich.
Hendrick Mfg. Co., Carbondale, Pa.
Independent Register Co., Cleveland, O.
Jamieson Mfg. Co., Dallas, Tex.
Johnston & Chapman Co., Chicago, Ill.
Lamneck Products, Inc., Middletown, O.
Lockjoint Wood Products Co., Wichita, Kans. (Wood)
Manhattan Perforated Metal Co., Inc., Long Island City, N. Y.
● Mueller Furnace Co., L. J., Milwaukee, Wis.
Mundt & Sons, Charles, Jersey City, N. J.
Newman Brothers, Inc., Cincinnati, O.
Register & Grille Mfg. Co., Brooklyn, N. Y.
Reliable Perforating Co., Chicago, Ill.
Rock Island Register Co., Rock Island, Ill.
Schoedinger, F. O., Columbus, O.
Standard Stamping & Perforating Co., Chicago, Ill.
Stewart Mfg. Co., Orange, N. J.
● Tuttle & Bailey, Inc., New Britain, Conn.
● United States Air Conditioning Corp., Minneapolis, Minn.
United States Register Co., Battle Creek, Mich.
Utility Fan Corp., Los Angeles, Calif.
Waterloo Register Co., Waterloo, Ia.
Western Wire & Iron Works, Inc., Chicago, Ill.
Wickwire Spencer Steel Co., New York, N. Y.
Wooster Art Wood, Inc., Wooster, O.

GUNS AND POTS, SMOKE AND SMUDGE, FOR TESTING AIR MOVEMENT

Hill, E. Vernon, Chicago, Ill.
Newman Co., Inc., I. C., New York, N. Y.
Pains Fireworks Display Co., New York, N. Y.

HAND SHEARS

See Shears and Snips, Hand

HANGERS OR BRACKETS, RADIATOR

American Foundry & Furnace Co., Bloomington, Ill.
American Radiator & Standard Sanitary Corp., Pittsburgh, Pa.
● Bell & Gossett Co., Morton Grove, Ill.
Carpenter & Paterson, Inc., East Boston, Mass.
Carty & Moore Engineering Co., Detroit, Mich.
Chicago Nipple Mfg. Co., Chicago, Ill.
● Crane Co., Chicago, Ill.
Crawford Co., Chicago, Ill.
Fee & Mason Mfg. Co., Inc., New York, N. Y.
Grabler Mfg. Co., Cleveland, O.
● Grinnell Co., Inc., Providence, R. I.
Hartmann Co., Chas., Brooklyn, N. Y.
Healy Ruff Co., St. Paul, Minn.
Jennison Co., Fitchburg, Mass. (Adjustable radiator foot rest)
McAlear Mfg. Co., Chicago, Ill.
National Radiator Co., The, Johnstown, Pa.
Pierce Butler Radiator Corp., Syracuse, N. Y.
Richmond Radiator Co., Gas Products Div., Uniontown, Pa.
United States Radiator Corp., Detroit, Mich.
Western Hanger Co., San Francisco, Calif.

HANGERS AND SUPPORTS, PIPE

Acme Tin Plate & Roofing Supply Co., Philadelphia, Pa.
● American District Steam Co., North Tonawanda, N. Y.
Beaton & Cadwell Mfg. Co., New Britain, Conn.
Carpenter & Paterson, Inc., East Boston, Mass.
Chicago Nipple Mfg. Co., Chicago, Ill.
● Crane Co., Chicago, Ill.
Crawford Co., Chicago, Ill.
Farley Sleeve & Hanger Co., Cleveland, O.
Fee & Mason Mfg. Co., Inc., New York, N. Y.
● Flori Pipe Co., The, St. Louis, Mo.
Frick Co., Waynesboro, Pa.
Genspring, Inc., New York, N. Y.
Globe Machine & Stamping Co., Cleveland, O.
Grabler Mfg. Co., Cleveland, O.
● Grinnell Co., Inc., Providence, R. I.
Healy Ruff Co., St. Paul, Minn.
Jarecki Mfg. Co., Erie, Pa.
● Midwest Piping & Supply Co., Inc., St. Louis, Mo.
National Valve & Mfg. Co., Pittsburgh, Pa.
Packless Metal Products Corp., New Rochelle, N. Y. (Flexible fasteners for metal hose and tubing)
Paine Co., Chicago, Ill.
Power Piping Div., Blaw-Knox Co., Pittsburgh, Pa.
Ravena Iron Co., Ravena, N. Y.
● Reznor Mfg. Co., Mercer, Pa.
● Ric-wiL Co., Cleveland, O. (Underground)
Rockwood Sprinkler Co., Worcester, Mass.
Roessing Mfg. Co., Pittsburgh, Pa.
Truscon Steel Co., Youngstown, O.
● Walworth Co., New York, N. Y.
Western Wire Products Co., St. Louis, Mo.

HARD RUBBER PIPE AND FITTINGS

See Pipe, Hard Rubber; Fittings, Pipe, Hard Rubber

HEADERS, WELDED

Acme Industries, Inc., Jackson, Mich.
American Locomotive Co., Alco Products Div., New York, N. Y.
● Baker Ice Machine Co., Inc., Omaha, Neb.
Biggs Boiler Works Co., E. Akron, O.
Chicago Nipple Mfg. Co., Chicago, Ill.
Clow & Sons, James B., Chicago, Ill.
Columbian Steel Tank Co., Kansas City, Mo.
● Crane Co., Chicago, Ill.
Downingtown Iron Works, Downingtown, Pa.
● Flori Pipe Co., The, St. Louis, Mo
Frick Co., Waynesboro, Pa.
● Grinnell Co., Inc., Providence, R. I.
International Engineering Wks., Inc., Framingham, Mass.
Kellogg Co., M. W., The, New York, N. Y.
Kopperman & Sons, Joseph, Philadelphia, Pa.
Limbert & Co., Geo. B., Chicago, Ill.
Lumsden & Van Stone Co., South Boston, Mass.
● Midwest Piping & Supply Co., Inc., St. Louis, Mo.
National Pipe Bending Co., New Haven, Conn.
National Valve & Mfg. Co., Pittsburgh, Pa.
Naylor Pipe Co., Chicago, Ill.
Ohio Pipe Bending & Mach. Co., Cleveland, O.
Philadelphia Pipe Bending Co., Philadelphia, Pa.
Pittsburgh Pipe Coil & Bending Co., Etna, Pa.
Pittsburgh Piping & Equipment Co., Pittsburgh, Pa.
Power Piping Div., Blaw-Knox Co., Pittsburgh, Pa.
Rempe Co., Chicago, Ill.
Richmond Engineering Co., Inc., Richmond, Va.
Roessing Mfg. Co., Pittsburgh, Pa.
Sales & Co., Murray W., Detroit, Mich.
Semet-Solvay Engineering Corp., New York, N. Y.
Shaw Co., Benjamin F., Wilmington, Del.
Shaw-Kendall Engineering Co., Toledo, O.
Vilter Mfg. Co., Milwaukee, Wis.
● Walworth Co., New York, N. Y.
Zallea Brothers & Johnson, Wilmington, Del.

HEADS, EXHAUST, FOR PIPE LINES

Aeolus Dickinson, Chicago, Ill.
Cochrane Corp., Philadelphia, Pa.
Hoppes Mfg. Co., Springfield, O.
● Kieley & Mueller, Inc., North Bergen, N. J.
Straight Line Foundry & Machine Corp., Direct Separator Div., The, Syracuse, N. Y.
Wright-Austin Co., Detroit, Mich.

HEADS, SPRINKLER

Binks Mfg. Co., Chicago, Ill.
Cleghorn Co., Boston, Mass.
● Grinnell Co., Inc., Providence, R. I.
Hodgman Mfg. Co., Taunton, Mass.
Raisler Corp., Grimes Sprinkler Div., New York, N. Y.
Rockwood Sprinkler Co., Worcester, Mass.

HEAT EXCHANGERS

See Chillers, Water; Condensers, Refrigerating; Exchangers, Heat; Surface, Cooling; Surface, Heating

● Advertisement in this issue. See Index to Advertisers, page 322.

HEATERS, AIR, DIRECT FIRED

- ● Air Devices, Inc., New York, N. Y.
- ● Airtherm Mfg. Co., St. Louis, Mo.
- American Foundry & Furnace Co., Bloomington, Ill.
- American Furnace Co., St. Louis, Mo.
- Campbell Heating Co., Des Moines, Ia.
- Campbell Heating Co., E. K., Kansas City, Mo.
- Century Engineering Corp., Cedar Rapids, Ia.
- Columbus Heating & Ventilating Co., Columbus, O.
- Despatch Oven Co., Minneapolis, Minn.
- ● Dravo Corp., Pittsburgh, Pa.
- Grand Rapids Blow Pipe & Dust Arrester Co., Grand Rapids, Mich.
- Jackson & Church Co., Saginaw, Mich.
- Lee Engineering Co., Youngstown, O.
- Magirl Foundry & Furnace Wks., P. H., Bloomington, Ill.
- McCann Furnace Co., Cleveland, O.
- National Airoil Burner Co., Inc., Philadelphia, Pa.
- ● National Heater Co., Minneapolis, Minn.
- National Mfg. & Engineering Co., Detroit, Mich.
- Nelson Co., Detroit, Mich.
- Palmer Mfg. Corp., Phoenix, Ariz.
- Ross Engineering Corp., J. O., New York, N. Y.
- Smith, Inc., James Campbell, Cleveland, O.
- Sonner Burner Co., Winfield, Kans.
- Supreme Heater & Ventilating Corp., St. Louis, Mo.
- Surface Combustion, Toledo, O.
- Whiting Corp., Harvey, Ill.
- Williams, Inc., F. C., Dearborn, Mich.

HEATERS, DUCT, ELECTRIC

- Consolidated Car-Heating Co., Inc., Albany, N. Y.
- Despatch Oven Co., Minneapolis, Minn.
- General Electric Co., Schenectady, N. Y.
- Hynes Electric Heating Co., Camden, N. J.
- Trent Co., Harold E., Philadelphia, Pa.
- Westinghouse Electric & Mfg. Co., Mansfield, O.
- ● Wiegand Co., Edwin L., Pittsburgh, Pa.

HEATERS, DUCT, GAS

- Atlas Heating & Ventilating Co., Ltd., San Francisco, Calif.
- ● Bryant Heater Co., The, Cleveland, O.
- Electrogas Furnace Co., San Francisco, Calif.
- Palmer Mfg. Corp., Phoenix, Ariz.
- Payne Furnace & Supply Co., Inc., Beverly Hills, Calif.
- ● Reznor Mfg. Co., Mercer, Pa.
- Royal Air Conditioning Equipment Co., Alhambra, Calif.
- Surface Combustion, Toledo, O.
- Utility Fan Corp., Los Angeles, Calif.

HEATERS, FEEDWATER

See Deaerators

HEATERS, GASOLINE FIRED (FOR AIRCRAFT)

- Selas Co., The, Strato-Heater Div., Philadelphia, Pa.
- Solar Aircraft Co., San Diego, Calif.
- Stewart-Warner Corp., Chicago, Ill.
- Surface Combustion, Toledo, O.

HEATERS, INDIRECT, SUBMERGED

- ● Bell & Gossett Co., Morton Grove, Ill.
- Frank Heaters, Inc., Paterson, N. J.
- General Fittings Co., Providence, R. I.
- Richmond Engineering Co., Inc., Richmond, Va.
- Standard Heater & Oil Equipment Co., Jersey City, N. J.
- Taco Heaters, Inc., New York, N. Y.
- Western Blower Co., Seattle, Wash.

HEATERS, STRIP AND IMMERSION, ELECTRIC

- American Instrument Co., Silver Spring, Md.
- Consolidated Car-Heating Co., Inc., Albany, N. Y.
- Cutler-Hammer, Inc., Milwaukee, Wis.
- ● Electric Arc, Inc., Newark, N. J.
- General Electric Co., Schenectady, N. Y.
- Hynes Electric Heating Co., Camden, N. J.
- Red Spot Electric Co., Tacoma, Wash.
- Swoboda, Inc., H. O., New Brighton, Pa.
- Trent Co., Harold E., Philadelphia, Pa.
- Vulcan Electric Co., Danvers, Mass.
- Westinghouse Electric & Mfg. Co., Mansfield, O.
- ● Wiegand Co., Edwin L., Pittsburgh, Pa.

HEATERS, UNIT, ELECTRIC HEATING ELEMENT

- ● Burnham Boiler Corp., Irvington, N. Y. (Radiator)
- Consolidated Car-Heating Co., Inc., Albany, N. Y.
- Electric Air Heater Co., Div. American Foundry Equipment Co., Mishawaka, Ind.
- General Electric Co., Schenectady, N. Y.
- Hynes Electric Heating Co., Camden, N. J.
- ● Ilg Electric Ventilating Co., Chicago, Ill.
- Red Spot Electric Co., Tacoma, Wash.
- Samson-United Corp., Rochester, N. Y.
- Trent Co., Harold E., Philadelphia, Pa.
- Vulcan Electric Co., Danvers, Mass.
- Westinghouse Electric & Mfg. Co., Mansfield, O.
- ● Wiegand Co., Edwin L., Pittsburgh, Pa.

HEATERS, UNIT, GAS FIRED

- Atlas Heating & Ventilating Co., Ltd., San Francisco, Calif.
- Automatic Gas Equipment Co., Pittsburgh, Pa.
- ● Bryant Heater Co., The, Cleveland, O.
- Campbell Heating Co., E. K., Kansas City, Mo.
- Clow & Sons, James B., Chicago, Ill.
- Continental Stove Corp., Ironton, O.
- General Gas Light Co., Kalamazoo, Mich.
- ● Ilg Electric Ventilating Co., Chicago, Ill.
- Lee Engineering Co., Youngstown, O.
- McCann Furnace Co., Cleveland, O.
- ● McCord Radiator & Mfg. Co., Detroit, Mich.
- ● Mueller Furnace Co., L. J., Milwaukee, Wis.
- Palmer Mfg. Corp., Phoenix, Ariz.
- ● Reznor Mfg. Co., Mercer, Pa.
- Surface Combustion, Toledo, O.
- Utility Fan Corp., Los Angeles, Calif.

HEATERS, UNIT, OIL FIRED

- ● Dravo Corp., Pittsburgh, Pa.
- Hare Engineering Co., Detroit, Mich.
- Lee Engineering Co., Youngstown, O.

HEATERS, UNIT, STEAM AND HOT WATER

- ● Airtherm Mfg. Co., St. Louis, Mo.
- American Blower Corp., Detroit, Mich.
- Bayley Blower Co., Milwaukee, Wis.
- Beacon-Morris Corp., Boston, Mass.
- Bern's Specialty Mfg. Co., Chicago, Ill.
- Bishop & Babcock Mfg. Co., Cleveland, O.
- Blower Application Co., Milwaukee, Wis.
- ● Buffalo Forge Co., Buffalo, N. Y.
- ● Burnham Boiler Corp., Irvington, N. Y.
- Campbell Heating Co., E. K., Kansas City, Mo.
- Carrier Corp., Syracuse, N. Y.
- Champion Unit Heater Co., Chicago, Ill.
- ● Clarage Fan Co., Kalamazoo, Mich.
- ● Dunham Co., C. A., Chicago, Ill.
- ● Fedders Mfg. Co., Inc., Buffalo, N. Y.
- Hartzell Propeller Fan Co., Piqua, O.
- Harvey-Whipple, Inc., Springfield, Mass.
- Hastings Air Conditioning Co., Hastings, Neb.
- ● Ilg Electric Ventilating Co., Chicago, Ill.
- Industrial Mfg. & Engrg. Co., Chicago, Ill.
- Jaden Mfg. Co., Inc., F., Hastings, Neb.
- ● Johnson Fan & Blower Corp., Chicago, Ill.
- King Ventilating Co., Owatonna, Minn.
- Kisco Boiler & Engineering Co., St. Louis, Mo.
- ● Kramer Trenton Co., Trenton, N. J.
- ● Marlo Coil Co., St. Louis, Mo.
- ● McCord Radiator & Mfg. Co., Detroit, Mich.
- McQuay, Inc., Minneapolis, Minn.
- ● Modine Mfg. Co., Racine, Wis.
- Murray Iron Wks. Co., Burlington, Ia.
- ● Murray Mfg. Co., D. J., Wausau, Wis.
- National Radiator Co., The, Johnstown, Pa.
- ● Nelson Corp., Herman, Moline, Ill.
- ● Nesbitt, Inc., John J., Philadelphia, Pa.
- New York Blower Co., Chicago, Ill.
- Niagara Blower Co., New York, N. Y.
- Refrigeration Economics Co., Inc., Canton, O.
- Richmond Engineering Co., Inc., Richmond, Va.
- Rome-Turney Radiator Co., Rome, N. Y.
- Ross Engineering Corp., J. O., New York, N. Y.
- Semco Mfg. Co., Nashville, Tenn.
- ● Skinner Heating & Ventilating Co., Inc., Div. of St. Louis Blow Pipe & Heater Co., St. Louis, Mo.
- Sturtevant Co., B. F., Boston, Mass.
- Super Radiator Corp., Minneapolis, Minn.
- Tenney Engineering, Inc., Montclair, N. J.
- ● Trane Co., The, La Crosse, Wis.
- ● United States Air Conditioning Corp., Minneapolis, Minn.
- ● Webster & Co., Warren, Camden, N. J.
- Western Blower Co., Seattle, Wash.
- ● Wing Mfg. Co., L. J., New York, N. Y.
- ● Young Radiator Co., Racine, Wis.

HEATERS, WATER, CAST IRON, COAL FIRED

- Adams Co., The, Dubuque, Ia.
- American Radiator & Standard Sanitary Corp., Pittsburgh, Pa
- ● Burnham Boiler Corp., Irvington, N. Y.
- Cleghorn Co., Boston, Mass.
- ● Crane Co., Chicago, Ill.
- Eastern Foundry Co., Peerless Heater Div., Boyertown, Pa
- ● Gehl Bros. Mfg. Co., West Bend, Wis.
- Glore Sales Corp., Evins F., New York, N. Y.
- International Heater Co., Utica, N. Y.
- National Radiator Co., The, Johnstown, Pa.
- Pierce Butler Radiator Corp., Syracuse, N. Y.
- ● Prox Co., Inc., Frank, Terre Haute, Ind.
- Schwitzer-Cummins Co., Indianapolis, Ind.
- ● Smith Co., Inc., H. B., The, Westfield, Mass.
- Spencer Heater Div., The Aviation Corp., Williamsport, Pa
- Thatcher Furnace Co., Garwood, N. J.
- United States Radiator Corp., Detroit, Mich.
- Weil-McLain Co., Chicago, Ill.

● Advertisement in this issue. See Index to Advertisers, page 322.

HEATERS, WATER, ELECTRIC

- Edison General Electric Appliance Co., Inc., Chicago, Ill.
- ● Hotstream Heater Co., Cleveland, O.
- Hynes Electric Heating Co., Camden, N. J.
- Red Spot Electric Co., Tacoma, Wash.
- Trent Co., Harold E., Philadelphia, Pa.
- Westinghouse Electric & Mfg. Co., Mansfield, O.

HEATERS, WATER, GAS FIRED

- American Radiator & Standard Sanitary Corp., Pittsburgh, Pa.
- ● Bryant Heater Co., The, Cleveland, O.
- ● Crane Co., Chicago, Ill.
- Dahlquist Mfg. Co., Inc., Somerville, Mass.
- Eastern Foundry Co., Peerless Heater Div., Boyertown, Pa.
- Eclipse Fuel Engineering Co., Rockford, Ill.
- Gerstein & Cooper Co., South Boston, Mass.
- Handley Brown Heater Co., Jackson, Mich.
- ● Hotstream Heater Co., Cleveland, O.
- International Engineering Wks., Inc., Framingham, Mass.
- Montgomery Bros., San Francisco, Calif.
- ● Mueller Furnace Co., L. J., Milwaukee, Wis.
- National Radiator Co., The, Johnstown, Pa.
- Pan-American Engineering Co., Berkeley, Calif.
- Pittsburgh Water Heater Corp., Pittsburgh, Pa.
- Richmond Radiator Co., Uniontown, Pa.
- Rotary Mfg. Co., Los Angeles, Calif.
- Ruud Mfg. Co., Pittsburgh, Pa.
- Schoedinger, F. O., Columbus, O.
- Sellers Engineering Co., Chicago, Ill.
- ● Smith Co., Inc., H. B., The, Westfield, Mass.
- Sonner Burner Co., Winfield, Kans.
- United States Radiator Corp., Detroit, Mich.

HEATERS, WATER, INDIRECT

- Akwa Heaters, Inc., New York, N. Y.
- American Radiator & Standard Sanitary Corp., Pittsburgh, Pa.
- ● Bell & Gossett Co., Morton Grove, Ill.
- Bryan Steam Corp., Peru, Ind.
- Davis Engineering Corp., Elizabeth, N. J.
- Downingtown Iron Works, Downingtown, Pa.
- Ferguson & Lange Foundry Co., Chicago, Ill.
- Frank Heaters, Inc., Paterson, N. J.
- General Fittings Co., Providence, R. I.
- ● Hotstream Heater Co., Cleveland, O.
- Kehm Corp., The, Chicago, Ill.
- Little Mfg. Co., M. S., Hartford, Conn.
- Sims Co., Erie, Pa.
- Standard Heater & Oil Equipment Co., Jersey City, N. J.
- Taco Heaters, Inc., New York, N. Y.
- ● Thrush & Co., H. A., Peru, Ind.
- Triplex Heating Specialty Co., Peru, Ind.
- Vapor Car Heating Co., Inc., Chicago, Ill.
- Western Blower Co., Seattle, Wash.

HEATERS, WATER, INDIRECT, COMBINATION TANK AND TANKLESS

- ● Bell & Gossett Co., Morton Grove, Ill.
- ● Burnham Boiler Corp., Irvington, N. Y.
- ● Hotstream Heater Co., Cleveland, O.
- Richmond Engineering Co., Inc., Richmond, Va.
- Standard Heater & Oil Equipment Co., Jersey City, N. J.
- Triplex Heating Specialty Co., Peru, Ind.
- Western Blower Co., Seattle, Wash.

HEATERS, WATER, OIL FIRED

- ● Air Devices, Inc., New York, N. Y.
- Bethlehem Foundry & Machine Co., Bethlehem, Pa.
- Century Engineering Corp., Cedar Rapids, Ia.
- Dahlquist Mfg. Co., Inc., Somerville, Mass.
- Electrol Mfg. Co., Passaic, N. J.
- Gerstein & Cooper Co., South Boston, Mass.
- Glore Sales Corp., Evins F., New York, N. Y.
- ● Hotstream Heater Co., Cleveland, O.
- International Engineering Wks., Inc., Framingham, Mass.
- Johnson Co., S. T., Oakland, Calif.
- Kleen-Heet, Inc., Chicago, Ill.
- Littleford Bros., Cincinnati, O.
- Lonergan Mfg. Co., Albion, Mich.
- National Airoil Burner Co., Inc., Philadelphia, Pa.
- Nu-Way Corp., Rock Island, Ill.
- Pacific Steel Boiler Div., United States Radiator Corp., Detroit, Mich.
- Pan-American Engineering Co., Berkeley, Calif.
- ● Petroleum Heat & Power Co., Stamford, Conn.
- Preferred Utilities Co., Inc., New York, N. Y.
- Ray Oil Burner Co., San Francisco, Calif.
- Reif-Rexoil, Inc., Buffalo, N. Y.
- Scott-Newcomb, Inc., St. Louis, Mo.
- ● Smith Co., Inc., H. B., The, Westfield, Mass.
- Spencer Heater Div., The Aviation Corp. Williamsport, Pa.
- United States Radiator Corp., Detroit, Mich.
- Vapor Car Heating Co., Inc., Chicago, Ill.
- Viking Mfg. Corp., Dayton, O.
- Williams Oil-O-Matic Heating Corp., Bloomington, Ill.
- York-Heat Div., York-Shipley, Inc., York, Pa.

HEATERS, WATER, STEAM, INSTANTANEOUS

- Akwa Heaters, Inc., New York, N. Y.
- ● American District Steam Co., North Tonawanda, N. Y.
- American Locomotive Co., Alco Products Div., New York, N
- ● Bell & Gossett Co., Morton Grove, Ill.
- Croll-Reynolds Engineering Co., Inc., New York, N. Y.
- Davis Engineering Corp., Elizabeth, N. J.
- Downingtown Iron Works, Downingtown, Pa.
- Eclipse Fuel Engineering Co., Rockford, Ill.
- Frank Heaters, Inc., Paterson, N. J.
- General Fittings Co., Providence, R. I.
- General Furnaces Corp., New York, N. Y.
- Gerstein & Cooper Co., South Boston, Mass.
- Hasco Valve & Machine Co., Milwaukee, Wis.
- Heat Transfer Products, Inc., New York, N. Y.
- Howard Iron Wks. & Alberger Heater Co., Buffalo, N. Y.
- Johnson Corp., Three Rivers, Mich.
- Montgomery Bros., San Francisco, Calif.
- National Pipe Bending Co., New Haven, Conn.
- O'Brien Steam Specialty Co., Syracuse, N. Y.
- ● Patterson-Kelley Co., Inc., East Stroudsburg, Pa.
- Pick Mfg. Co., West Bend, Wis. (direct steam injection)
- Quaker City Iron Works, Philadelphia, Pa.
- Richmond Engineering Co., Inc., Richmond, Va.
- Ross Heater & Mfg. Co., Inc., Buffalo, N. Y.
- Schutte & Koerting Co., Philadelphia, Pa.
- Sims Co., Erie, Pa.
- Standard Heater & Oil Equipment Co., Jersey City, N. J.
- Super Radiator Corp., Minneapolis, Minn.
- Swartwout Co., Cleveland, O.
- Taco Heaters, Inc., New York, N. Y.
- ● Whitlock Mfg. Co., Hartford, Conn.
- Zalfea Brothers & Johnson, Wilmington, Del.

HEATERS, WATER, STEAM, STORAGE

- Akwa Heaters, Inc., New York, N. Y.
- ● American District Steam Co., North Tonawanda, N. Y.
- ● Bell & Gossett Co., Morton Grove, Ill.
- Bros Boiler & Mfg. Co., Wm., Minneapolis, Minn.
- Brownell Co., Dayton, O.
- ● Burnham Boiler Corp., Irvington, N. Y.
- Davis Engineering Co., Elizabeth, N. J.
- Downington Iron Works, Downington, Pa.
- Frank Heaters, Inc., Paterson, N. J.
- General Fittings Co., Providence, R. I.
- Gerstein & Cooper Co., South Boston, Mass.
- Heat Transfer Products, Inc., New York, N. Y.
- Howard Iron Wks. & Alberger Heater Co., Buffalo, N. Y.
- International Engineering Wks., Inc., Framingham, Mass.
- Johnson Corp., Three Rivers, Mich.
- ● Kewanee Boiler Corp., Kewanee, Ill.
- Kopperman & Sons, Joseph, Philadelphia, Pa.
- Koven & Bro., Inc., L. O., Jersey City, N. J.
- Manitowoc Boiler Wks., Manitowoc, Wis.
- National Pipe Bending Co., New Haven, Conn.
- O'Brien Steam Specialty Co., Syracuse, N. Y.
- ● Patterson-Kelley Co., Inc., East Stroudsburg, Pa.
- Quaker City Iron Works, Philadelphia, Pa.
- Richmond Engineering Co., Inc., Richmond, Va.
- Rotary Mfg. Co., Los Angeles, Calif.
- Sims Co., Erie, Pa.
- Standard Heater & Oil Equipment Co., Jersey City, N. J.
- Super Radiator Corp, Minneapolis, Minn.
- Vogt Machine Co., Henry, Louisville, Ky.
- Warren Electric Appliance Co., Warren, Pa. (Electric)
- Waterfilm Boilers, Inc., Jersey City, N. J.
- ● Whitlock Mfg. Co., Hartford, Conn.

HEATERS, WATER, STEEL, COAL FIRED

- Bros Boiler & Mfg. Co., Wm., Minneapolis, Minn.
- Catskill Metal Works, Inc., Catskill, N. Y.
- ● Fitzgibbons Boiler Co., New York, N. Y.
- International Engineering Wks., Inc., Framingham, Mass.
- Johnson Bros., Inc., Ferrysburg, Mich.
- ● Kewanee Boiler Corp., Kewanee, Ill.
- Lookout Boiler & Mfg. Co., Chattanooga, Tenn.
- National Radiator Co., The, Johnstown, Pa.
- Pacific Steel Boiler Div., United States Radiator Corp, Detroit, Mich.
- Pan-American Engineering Co., Berkeley, Calif.
- Spencer Heater Div., The Aviation Corp., Williamsport, Pa.
- Stokermatic Co., Salt Lake City, Utah

HEATING BOILERS

See Boilers, Heating

HEATING COILS

See Surface, Heating

HEATING SURFACE

See Surface, Heating

HOSE, METAL, FOR ELIMINATING COMPRESSOR VIBRATION

- American Metal Hose Branch, American Brass Co., Waterbury, Conn.
- Atlantic Metal Hose Co., Inc., New York, N. Y.
- Bendix Aviation Corp., Philadelphia Div., Philadelphia, Pa.

● Advertisement in this issue. See Index to Advertisers, page 322.

- Chicago Metal Hose Corp., Maywood, Ill.
- Everhot Products Co., Chicago, Ill.
- Packless Metal Products Corp., New Rochelle, N. Y.
- Pennsylvania Flexible Metallic Tubing Co., Philadelphia, Pa.
- Seamlex Co., Inc., Long Island City, N. Y.
- Titeflex Metal Hose Co., Newark, N. J.
- United Metal Hose Co., Inc., Long Island City, N. Y.
- Zallea Brothers & Johnson, Wilmington, Del.

HOT WATER HEATING SYSTEMS

See Systems, Heating, Hot Water

HOT WATER PRESSURE REGULATORS

See Regulators, Pressure, Hot Water Heating Systems

HOUSINGS, FAN, CENTRIFUGAL

(Housing only—not complete fans)

- Air Controls, Inc., Cleveland, O.
- Brundage Co., The, Kalamazoo, Mich.
- ● Clarage Fan Co., Kalamazoo, Mich.
- Commercial Shearing & Stamping Co., Youngstown, O.
- ● Detroit Stamping Co., Detroit, Mich.
- Economy Electric Mfg. Co., Chicago, Ill.
- General Blower Corp., San Francisco, Calif.
- Hastings Air Conditioning Co., Inc., Hastings, Nebr.
- Lau Blower Co., Dayton, O.
- National Mfg. & Engineering Co., Detroit, Mich.
- Sandberg Sheet Metal Works, Portland, Ore.
- Schwitzer-Cummins Co., Indianapolis, Ind.
- Sturtevant Co., B. F., Hyde Park, Boston, Mass.
- Torrington Mfg. Co., Torrington, Conn.
- ● United States Air Conditioning Corp., Minneapolis, Minn.
- Viking Air Conditioning Corp., Cleveland, O.

HOUSINGS, FAN, PROPELLER

(Housings only—not complete fans)

- Commercial Shearing & Stamping Co., Youngstown, O.

HUMIDIFIERS, CENTRAL PLANT

- ● Air & Refrigeration Corp., New York, N. Y.
- American Blower Corp., Detroit, Mich.
- ● Armstrong Machine Wks., Three Rivers, Mich.
- Bahnson Co., Winston-Salem, N. C.
- ● Barber-Colman Co., Rockford, Ill.
- Carrier Corp., Syracuse, N. Y.
- ● Clarage Fan Co., Kalamazoo, Mich.
- Farr Co., Los Angeles, Calif.
- ● Johnson Service Co., Milwaukee, Wis.
- Mellish & Murray Co., Chicago, Ill.
- ● Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
- Monmouth Products Co., Cleveland, O.
- National Engineering & Mfg. Co., Kansas City, Mo.
- Parks-Cramer Co., Fitchburg, Mass.
- ● Powers Regulator Co., Chicago, Ill.
- Research Corp., New York, N. Y.
- Ross Engineering Corp., J. O., New York, N. Y.
- Skuttle Mfg. Co., Detroit, Mich.
- Spray-Wheel Air Conditioners, Inc., Denver, Colo.
- Steamaire Co., Cincinnati, O.
- Strandwitz & Co., Inc., W. J., Camden, N. J.
- Sturtevant Co., B. F., Hyde Park, Boston, Mass.
- Surface Combustion, Toledo, O.
- ● Trane Co., The, La Crosse, Wis.
- Viking Air Conditioning Corp., Cleveland, O.
- Vilter Mfg. Co., Milwaukee, Wis.

HUMIDIFIERS, DIRECT, SPRAY HEAD

- ● Air & Refrigeration Corp., New York, N. Y.
- American Moistening Co., Providence, R. I.
- Anetsberger Bros., Chicago, Ill.
- Bahnson Co., Winston-Salem, N. C.
- Betz Engineering Co., Kansas City, Mo.
- Binks Mfg. Co., Chicago, Ill.
- Blower Application Co., Milwaukee, Wis.
- ● Buffalo Forge Co., Buffalo, N. Y.
- ● Chelsea Fan & Blower Co., Irvington, N. J.
- International Moistening Co., Providence, R. I.
- Lohman Co., Wm. J., Irvington, N. J.
- Manufacturers Machine Co., North Andover, Mass.
- ● Marley Co., Kansas City, Kans.
- ● Murray Mfg. Co., D. J., Wausau, Wis.
- New York Blower Co., Chicago, Ill.
- Parks-Cramer Co., Fitchburg, Mass.
- Pfening Co., Fred D., Columbus, O.
- Rhode Island Humidifier & Ventilating Co., Boston, Mass.
- Ross Sprinkler Co., Pasadena, Calif.
- Somers, Inc., H. J., Detroit, Mich.
- Spray Engineering Co., Somerville, Mass.
- ● Spraying Systems Co., Chicago, Ill.
- Steamaire Co., Cincinnati, O.
- Supreme Electric Products Corp., Rochester, N. Y.
- Utility Fan Corp., Los Angeles, Calif.

HUMIDIFIERS FOR RADIATORS AND CONVECTORS

- Bridgeport Brass Co., Bridgeport, Conn.
- Lowell Air Conditioning Corp., Philadelphia, Pa.
- ● Maid-O'-Mist, Inc., Chicago, Ill.
- ● McDonnell & Miller, Chicago, Ill.
- Patent Novelty Co., Fulton, Ill.
- Skilbeck Mfg. Co., Kenosha, Wis.

HUMIDIFIERS, RADIATOR VENT VALVE

- ● Maid-O'-Mist, Inc., Chicago, Ill.
- Skilbeck Mfg. Co., Kenosha, Wis.

HUMIDIFIERS, UNIT, ROOM TYPE (Without Heating)

- Betz Engineering Co., Kansas City, Mo.
- Carrier Corp., Syracuse, N. Y.
- Comfort Products Corp., Harvey, Ill.
- Cugley Incubator Co., Elkhart, Ind.
- Fairbanks, Morse & Co., Chicago, Ill.
- General Air Conditioning Corp., Cincinnati, O.
- Kauffman Air Conditioning Corp., St. Louis, Mo.
- Lion Mfg. Corp., Chicago, Ill.
- ● Murray Mfg. Co., D. J., Wausau, Wis.
- National Engineering & Mfg. Co., Kansas City, Mo.
- Norwood Filtration Co., The, Florence, Mass.
- Skilbeck Mfg. Co., Kenosha, Wis.
- Somers, Inc., H. J., Detroit, Mich.
- Spray-Wheel Air Conditioners, Inc., Denver, Colo.
- Standard Engineering Wks., Pawtucket, R. I.
- Steamaire Co., Cincinnati, O.
- ● United States Air Conditioning Corp., Minneapolis, Minn.

HUMIDIFYING RADIATORS

See Radiators, Humidifying

HUMIDISTATS

- American Moistening Co., Providence, R. I.
- Au-Temp-Co Corp., New York, N. Y.
- Bahnson Co., Winston-Salem, N. C.
- ● Barber-Colman Co., Rockford, Ill.
- Bristol Co., Waterbury, Conn.
- Friez Instrument Div., Bendix Aviation Corp., Towson, Md.
- H-B Instrument Co., Philadelphia, Pa.
- ● Johnson Service Co., Milwaukee, Wis.
- ● Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
- Parks-Cramer Co., Fitchburg, Mass.
- ● Penn Electric Switch Co., Goshen, Ind.
- ● Powers Regulator Co., Chicago, Ill.
- ● Sarcotherm Controls, Inc., Chicago, Ill.
- Standard Engineering Wks., Pawtucket, R. I.
- Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
- ● White-Rodgers Electric Co., St. Louis, Mo.

HUMIDITY RECORDERS

See Recorders, Humidity

HUMIDITY AND TEMPERATURE CONTROLS

See Humidistats; Recorder-Controllers; Thermostats

HYDRAULIC SPEED CHANGERS

See Changers, Speed, Hydraulic Coupling

HYGROMETERS

- American Moistening Co., Providence, R. I.
- Bristol Co., Waterbury, Conn.
- Brown Instrument Co., Div. of Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.
- Fee and Stemwedel, Inc., Chicago, Ill.
- Foxboro Co., Foxboro, Mass.
- Friez Instrument Div., Bendix Aviation Corp., Towson, Md.
- G. M. Mfg. Co., New York, N. Y.
- H-B Instrument Co., Philadelphia, Pa.
- Hill, E. Vernon, Chicago, Ill.
- International Moistening Co., Providence, R. I.
- ● Johnson Service Co., Milwaukee, Wis.
- ● Leeds & Northrup Co., Philadelphia, Pa. (recording)
- Moeller Instrument Co., Richmond Hill, N. Y.
- Palmer Co., Cincinnati (Norwood), O.
- Parks-Cramer Co., Fitchburg, Mass.
- Precision Thermometer & Instrument Co., Philadelphia, Pa.
- Scientific Instrument Co., Detroit, Mich.
- Standard Thermometer, Inc., Boston, Mass.
- Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
- Taylor Instrument Companies, Rochester, N. Y.
- Trerice Co., H. O., Detroit, Mich.
- Weksler Thermometer Corp., New York, N. Y.

HYGROSTATS

See Humidistats

IMMERSION THERMOSTATS

See Thermostats, Immersion

INDICATING THERMOMETERS

See Thermometers, Indicating

INDICATOR-CONTROLLERS, PRESSURE

- Bailey Meter Co., Cleveland, O.
- Bristol Co., The, Waterbury, Conn.
- Brown Instrument Co., Div. of Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.

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● Cash Co., A. W., Decatur, Ill.
Foxboro Co., Foxboro, Mass.
Hanlon-Waters, Inc., Tulsa, Okla.
● Hays Corp., Michigan City, Ind.
● Leeds & Northrup Co., Philadelphia, Pa.
Mason-Neilan Regulator Co., Boston, Mass.
Scientific Instrument Co., Detroit, Mich.
Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
Taylor Instrument Companies, Rochester, N. Y.
Trerice Co., H. O., Detroit, Mich.
Wheelco Instruments Co., Chicago, Ill.

INDICATOR-CONTROLLERS, RELATIVE HUMIDITY

● Barber-Colman Co., Rockford, Ill.
Bristol Co., Waterbury, Conn.
Brown Instrument Co., Div. Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.
Foxboro Co., Foxboro, Mass.
● Johnson Service Co., Milwaukee, Wis.
● Leeds & Northrup Co., Philadelphia, Pa.
Mason-Neilan Regulator Co., Boston, Mass.
Scientific Instrument Co., Detroit, Mich.
Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
Taylor Instrument Companies, Rochester, N. Y.

INDICATOR-CONTROLLERS, TEMPERATURE

Bailey Meter Co., Cleveland, O.
Bristol Co., Waterbury, Conn.
Brown Instrument Co., Div. Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.
● Cash Co., A. W., Decatur, Ill.
Fischer & Porter Co., Hatboro, Pa.
Foxboro Co., Foxboro, Mass.
● Johnson Service Co., Milwaukee, Wis.
● Leeds & Northrup Co., Philadelphia, Pa.
Mason-Neilan Regulator Co., Boston, Mass.
Pyrometer Instrument Co., New York, N. Y.
Scientific Instrument Co., Detroit, Mich.
Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
Taylor Instrument Companies, Rochester, N. Y.
Thwing-Albert Instrument Co., Philadelphia, Pa.
Trerice Co., H. O., Detroit, Mich.
Wheelco Instruments Co., Chicago, Ill.

INDICATORS, CARBON DIOXIDE, BOILER ROOM

For portable CO_2 analyzers, see Analyzers, Carbon Dioxide, Portable

Defender Automatic Regulator Co., St. Louis, Mo.
Engelhard, Inc., Chas., Newark, N. J.
Fischer & Porter Co., Hatboro, Pa.
● Hays Corp., Michigan City, Ind.
● Leeds & Northrup Co., Philadelphia, Pa.
Permutit Co., New York, N. Y.
Republic Flow Meters Co., Chicago, Ill.
Weaver Mfg. Co., Springfield, Ill.

INDICATORS, SOUND LEVEL

General Electric Co., Schenectady, N. Y.

INDIRECT HEATING SURFACE

See Surface, Heating

INDIRECT WATER HEATERS

See Heaters, Water, Indirect

INDUSTRIAL AIR CONDITIONERS

See Units, Air Conditioning, Industrial Type

INSTANTANEOUS WATER HEATERS

See Heaters, Water, Steam, Instantaneous

INSULATION, BOILER AND TANK

Acme Asbestos Covering & Flooring Co., Chicago, Ill.
Alfol Insulation Co., Inc., New York, N. Y. (Aluminum foil)
Armstrong Cork Co., Lancaster, Pa.
Baldwin-Hill Co., Trenton, N. J. (Rock wool)
Barrett Div., The, Allied Chemical & Dye Corp., New York, N. Y.
Botfield Refractories Co., Philadelphia, Pa.
● Carey Mfg. Co., Philip, Lockland, Cincinnati, O.
Cork Import Corp., New York, N. Y. (Cork, mineral wool board)
Cork Insulation Co., Inc., New York, N. Y. (Cork)
Eagle-Picher Lead Co., Cincinnati, O.
Ehret Magnesia Mfg. Co., Valley Forge, Pa. (Magnesia)
● Grant Wilson, Inc., Chicago, Ill.
Hinde & Dauch Paper Co., Sandusky, O.
International Vermiculite Co., Springfield, Ill.
Jamar Co., Walker, Duluth, Minn.
Johns-Manville, New York, N. Y.
Keasbey Co., Robert A., New York, N. Y. (Asbestos)
Keasbey & Mattison Co., Ambler, Pa.
Krehbiel Co., J. H., Chicago, Ill.
Mitchell & Smith, Inc., Detroit, Mich.
● Mundet Cork Corp., Brooklyn, N. Y. (Cork)
Munn and Steele, Inc., Newark, N. J.
National Gypsum Co., Buffalo, N. Y. (Rock wool)
Norristown Magnesia & Asbestos Co., Norristown, Pa. (Asbestos and magnesia)
● Owens-Corning Fiberglas Corp., Toledo, O. (Blanket)
Pacific States Felt & Mfg. Co., Inc., San Francisco, Calif.
Plant Rubber & Asbestos Works, San Francisco, Calif.
Poe Co., C. W., Cleveland, O.
Quigley Co., Inc., New York, N. Y.
Refractory & Insulation Corp., New York, N. Y. (Blanket, block, cement)
Reynolds Metals Co., Richmond, Va.
Robinson Insulation Co., Great Falls, Mont.
Ruberoid Co., New York, N. Y. (Asbestos, magnesia)
● Sall Mountain Co., Chicago, Ill.
Schundler & Co., Inc., F. E., Long Island City, N. Y.
Smith & Kanzler Corp., Elizabeth, N. J.
Standard Asbestos Mfg. Co., Chicago, Ill.
Tennessee Products Corp., Nashville, Tenn.
Therminsul Corp., Kalamazoo, Mich. (Felted block)
Union Asbestos & Rubber Co., Cicero, Ill.
United Cork Co., Kearny, N. J. (Cork)
Universal Zonolite Insulation Co., Chicago, Ill. (Plastic)
Walker Jamar Co., Duluth, Minn.
● Wilson, Inc., Grant, Chicago, Ill.

INSULATION, BUILDING

Acme Asbestos Covering & Flooring Co., Chicago, Ill. (Rock wool)
Air-O-Cel Industries, Inc., Detroit, Mich.
Alfol Insulation Co., New York, N. Y. (Aluminum foil)
Alton Mineral Wool Insulation Co., Alton, Ill.
Aluminum Co. of America, Pittsburgh, Pa.
American Flange & Mfg. Co., Inc., New York, N. Y. (Metal sheets)
American Hair & Felt Co., Chicago, Ill. (Hair felt)
Armstrong Cork Co., Lancaster, Pa. (Corkboard, fibreboard and cellular glass)
Bache & Co., Semon, New York, N. Y. (Glass wool)
Baldwin-Hill Co., Trenton, N. J. (Rock wool)
Barber Asphalt Corp., Barber, N. J.
Barrett Div., The, Allied Chemical & Dye Corp., New York, N. Y.
Berry, Jr. & Co., Inc., F. E., Boston, Mass.
Cabot, Inc., Samuel, Boston, Mass. (Flexible)
● Carey Mfg. Co., Philip, Lockland, Cincinnati, O. (Rock wool)
Carney Rockwool Co., Mankato, Minn.
Celotex Corp., The, Chicago, Ill.
Certain-teed Products Corp., New York, N. Y. (Board, reflective)
Chamberlin Metal Weather Strip Co., Detroit, Mich. (Rock wool)
Cork Import Corp., New York, N. Y. (Cork, mineral wool board)
Cork Insulation Co., Inc., New York, N. Y. (Corkboard)
Doheny Co., John J., Belmont, Mass. (Blanket)
Dry-Zero Corp., Chicago, Ill.
Eagle-Picher Lead Co., Cincinnati, O. (Mineral wool, blankets, batts, granulated, loose)
Ehret Magnesia Mfg. Co., Valley Forge, Pa.
Fir-Tex Insulating Board Co., St. Helens, Ore. (Wood fibre-board)
Flintkote Co., The, New York, N. Y. (Fiber board and rock wool)
General Insulating Products Co., Brooklyn, N. Y. (Rock wool)
● Grant Wilson, Inc., Chicago, Ill. (Rockwool)
Hinde & Dauch Paper Co., Sandusky, O.
Insulite Div. Minnesota and Ontario Paper Co., Minneapolis, Minn. (Wood fibre)
Insul-Wool Insulation Corp., Wichita, Kans.
International Vermiculite Co., Springfield, Ill. (Loose fill)
Johns-Manville, New York, N. Y. (Rock wool and wood fibre-board)
Johnston Tin Foil & Metal Co., St. Louis, Mo. (Foil, aluminum, tin, lead)
Keasbey Co., Robert A., New York, N. Y. (Rock wool)
Keasbey & Mattison Co., Ambler, Pa. (Asbestos)
Kimberly-Clark Corp., Neenah, Wis.
Ludowici-Celadon Co., Chicago, Ill. (wool)
Marblehead Lime Co., Chicago, Ill. (Rock wool)
Masonite Corp., Cellufoam Products Div., Chicago, Ill.
Mineral Insulation Co., Chicago Ridge, Ill. (Rock wool)
Mitchell & Smith, Inc., Detroit, Mich.
Multi-Cell Sales Corp., Minneapolis, Minn. (Blanket, quilted newspaper)
● Mundet Cork Corp., Brooklyn, N. Y. (Cork)
Munn & Steele, Inc., Newark, N. J.
National Gypsum Co., Buffalo, N. Y.
Nelson Mfg. Co., B. F., Minneapolis, Minn.
● Owens-Corning Fiberglas Corp., Toledo, O.
Pacific Lumber Co., The, San Francisco, Calif.
Pacific States Felt & Mfg. Co., Inc., San Francisco, Calif.
Plant Rubber & Asbestos Works, San Francisco, Calif.
Plastergon Wall Board Co., Buffalo, N. Y. (Rigid board)
Poe Co., C. W., Cleveland, O.
Refractory & Insulation Corp., New York, N. Y. (Rock, slag wool)
Reynolds Metal Co., Richmond, Va.
Robinson Insulation Co., Great Falls, Mont.
Ruberoid Co., New York, N. Y. (Mineral wool)
Russell Co., F. C., Cleveland, O.
Silvercote Products, Inc., Chicago, Ill.
Specialty Converters, Inc., East Braintree, Mass. (Reflective insulation)

● Advertisement in this issue. See Index to Advertisers, page 322.

Sprayo-Flake Co., Chicago, Ill.
Standard Asbestos Mfg. Co., Chicago, Ill. (Asbestos, hairfelt)
Standard Lime & Stone Co., Baltimore, Md. (Rock wool)
Tennessee Products Corp., Nashville, Tenn.
Therminsul Corp., Kalamazoo, Mich. (Rock wool block)
Truscon Steel Co., Youngstown, O. (Insulation board sealed between metal sheets)
United Cork Companies, Lyndhurst, N. J. (Cork)
United States Gypsum Co., Chicago, Ill. (Wool and board)
United States Mineral Wool Co., Chicago, Ill. (Mineral wool)
Universal Gypsum & Lime Co., Chicago, Ill. (Loose fill)
Universal Zonolite Insulation Co., Chicago, Ill. (Loose fill)
Western Mineral Products Co., Omaha 1, Nebr.
Wilson & Co., Chicago, Ill. (Board)
● Wilson, Inc., Grant, Chicago, Ill. (Rock wool)
Wood Conversion Co., St. Paul, Minn.

INSULATION, CEILING AND WALL, SOUND DEADENING

Acoustical treatment only—for thermal insulation, see Insulation, Building

Air-O-Cel Industries, Inc., Detroit, Mich.
American Hair & Felt Co., Chicago, Ill.
Armstrong Cork Co., Lancaster, Pa.
Baldwin-Hill Co., Trenton, N. J.
Barrett Div., The, Allied Chemical & Dye Corp., New York, N. Y.
Berry, Jr. & Co., F. E., Everett, Mass.
Celotex Corp., The, Chicago, Ill.
Doheny Co., John J., Belmont, Mass.
Felters Co., Inc., Boston, Mass.
Fir-Tex Insulating Board Co., St. Helens, Ore.
General Insulating Products Co., Brooklyn, N. Y.
Insulite Div. Minnesota and Ontario Paper Co., Minneapolis, Minn.
Insul-Wool Insulation Corp., Wichita, Kans.
Inter-Coastal Paint Corp., East St. Louis, Ill.
Johns-Manville, New York, N. Y.
Keasbey & Mattison Co., Ambler, Pa.
Masonite Corp., Chicago, Ill. (Fibreboard)
Mitchell & Smith, Inc., Detroit, Mich.
● Mundet Cork Corp., Brooklyn, N. Y.
National Gypsum Co., Buffalo, N. Y.
● Owens-Corning Fiberglas Corp., Toledo, O.
Pacific Lumber Co., The, San Francisco, Calif.
Pacific States Felt & Mfg. Co., Inc., San Francisco, Calif.
Plant Rubber & Asbestos Works, San Francisco, Calif.
Reynolds Metals Co., Richmond, Va.
Robinson Insulation Co., Great Falls, Mont.
Simplex Ceiling Co., New York, N. Y.
Sprayo-Flake Co., Chicago, Ill.
Technical Ply-Woods, Chicago, Ill.
Therminsul Corp., Kalamazoo, Mich.
United States Gypsum Co., Chicago, Ill.
Universal Zonolite Insulation Co., Chicago, Ill.
Western Silicair Products, Inc., Burbank, Calif.
Wood Conversion Co., St. Paul, Minn.

INSULATION, DUCT, SOUND DEADENING

For application inside duct

American Hair & Felt Co., Chicago, Ill.
Baldwin-Hill Co., Trenton, N. J. (Rock wool)
Barrett Div., The, Allied Chemical & Dye Corp., New York, N. Y.
Berry, Jr. & Co., Inc., F. E., Everett, Mass.
Cabot, Inc., Samuel, Boston, Mass.
● Carey Mfg. Co., Philip, Cincinnati, O.
Celotex Corp., The, Chicago, Ill.
Ehret Magnesia Mfg. Co., Valley Forge, Pa.
Felters Co., Inc., Boston, Mass.
● Grant Wilson, Inc., Chicago, Ill.
Insulite Div. Minnesota and Ontario Paper Co., Minneapolis, Minn.
Johns-Manville, New York, N. Y.
Keasbey Co., Robert A., New York, N. Y.
Kimberly-Clark Corp., Neenah, Wis.
● Mortell Co., J. W., Kankakee, Ill.
● Owens-Corning Fiberglas Corp., Toledo, O.
Pacific States Felt & Mfg. Co., Inc., San Francisco, Calif.
Plant Rubber & Asbestos Works, San Francisco, Calif.
Reynolds Metals Co., Richmond, Va.
Robinson Insulation Co., Great Falls, Mont.
Telsit Insulation Co., Bronx, N. Y.
Universal Zonolite Insulation Co., Chicago, Ill.
Western Felt Works, Chicago, Ill.
Western Silicair Products, Inc., Burbank, Calif.
● Wilson, Inc., Grant, Chicago, Ill.

INSULATION, DUCT, THERMAL

Acme Asbestos Covering & Flooring Co., Chicago, Ill. (Asbestos)
Air-O-Cel Industries, Inc., Detroit, Mich.
Alfol Insulation Co., New York, N. Y. (Aluminum foil)
American Flange & Mfg. Co., Inc., New York, N. Y. (Metal sheets)
American Hair & Felt Co., Chicago, Ill. (Hair felt)
Armstrong Cork Co., Lancaster, Pa. (Corkboard, fibreboard)
Baldwin-Hill Co., Trenton, N. J.
Barrett Div., The, Allied Chemical & Dye Corp., New York, N. Y.
Berry, Jr. & Co., Inc., F. E., Boston, Mass.
Cabot, Inc., Samuel, Boston, Mass. (Flexible)
● Carey Mfg. Co., Philip, Lockland, Cincinnati, O. (Asbestos)
Celotex Corp., The, Chicago, Ill.
Cork Import Corp., New York, N. Y. (Cork, mineral wool board)
Cork Insulation Co., Inc., New York, N. Y. (Cork board)
Dry-Zero Corp., Chicago, Ill.
Eagle-Picher Lead Co., Cincinnati, O. (Mineral wool blankets)
Ehret Magnesia Mfg. Co., Valley Forge, Pa. (Cork, magnesia, hair felt)
Felters Co., Inc., Boston, Mass. (Wool felt)
Fir-Tex Insulating Board Co., St. Helens, Ore. (Wood fibreboard)
General Insulating Products Co., Brooklyn, N. Y. (Acoustic rock wool)
Goodrich Co., B. F., Akron, O.
● Grant Wilson, Inc., Chicago, Ill.
Hinde & Dauch Paper Co., Sandusky, O.
Insulite Div. Minnesota and Ontario Paper Co., Minneapolis, Minn. (Wood fibre)
International Vermiculite Co., Springfield, Ill. (Block)
Johns-Manville, New York, N. Y. (Rock cork, asbestos)
Keasbey Co., Robert A., New York, N. Y. (Asbestos and cork)
Keasbey & Mattison Co., Ambler, Pa. (Asbestos)
Kennedy, Inc., David E., Brooklyn, N. Y.
Keystone Asphalt Products Co., Chicago, Ill.
Kimberly-Clark Corp., Neenah, Wis.
Masonite Corp., Chicago, Ill.
Mineral Insulation Co., Chicago Ridge, Ill. (Rock wool)
Mitchell & Smith, Inc., Detroit, Mich. (Cork)
● Mortell Co., J. W., Kankakee, Ill. (Plastic cork coating)
● Mundet Cork Corp., Brooklyn, N. Y. (Cork)
Munn and Steele, Inc., Newark, N. J.
National Gypsum Co., Buffalo, N. Y. (Block)
Norristown Magnesia & Asbestos Co., Norristown, Pa. (Asbestos and wool felt)
● Owens-Corning Fiberglas Corp., Toledo, O. (Blanket)
Pacific States Felt & Mfg. Co., Inc., San Francisco, Calif.
Plant Rubber & Asbestos Works, San Francisco, Calif.
Poe Co., C. W., Cleveland, O.
Quigley Co., Inc., New York, N. Y.
Refractory & Insulation Corp., New York, N. Y. (Block, blanket)
Reynolds Metals Co., Richmond, Va.
Robinson Insulation Co., Great Falls, Mont.
Ruberoid Co., New York, N. Y. (Asbestos cellular and laminated sheets or blocks)
● Sall Mountain Co., Chicago, Ill. (Asbestos)
Schundler & Co., Inc., F. E., Long Island City, N. Y.
Smith & Kanzler Corp., Elizabeth, N. J. (Asbestos air cell type)
Sprayo-Flake Co., Chicago, Ill.
Standard Asbestos Mfg. Co., Chicago, Ill. (Asbestos, hair felt)
Telsit Insulation Co., Bronx, N. Y.
Therminsul Corp., Kalamazoo, Mich. (Rock wool bats, loose and granulated)
United Cork Companies, Lyndhurst, N. J. (Cork)
United States Mineral Wool Co., Chicago, Ill.
Universal Zonolite Insulation Co., Chicago, Ill. (Plastic)
Western Felt Wks., Chicago, Ill. (Felt)
Wilson & Co., Chicago, Ill. (Flexible)
● Wilson, Inc., Grant, Chicago, Ill.
Wood Conversion Co., St. Paul, Minn.

INSULATION, PIPE

Acme Asbestos Covering & Flooring Co., Chicago, Ill.
Alfol Insulation Co., New York, N. Y. (Aluminum foil)
● American District Steam Co., North Tonawanda, N. Y. (Underground)
American Hair & Felt Co., Chicago, Ill.
Armstrong Cork Co., Lancaster, Pa. (Cork)
Baldwin-Hill Co., Trenton, N. J. (Rock wool)
Barrett Div., The, Allied Chemical & Dye Corp., New York, N. Y.
● Carey Mfg. Co., Philip, Lockland, Cincinnati, O. (Asbestos, magnesia)
Cork Import Corp., New York, N. Y. (Cork)
Cork Insulation Co., New York, N. Y.
Eagle-Picher Lead Co., Cincinnati, O. (Mineral wool)
Ehret Magnesia Mfg. Co., Valley Forge, Pa.
Goodrich Co., B. F., Akron, O.
● Grant Wilson, Inc., Chicago, Ill.
Hinde & Dauch Paper Co., Sandusky, O.
International Vermiculite Co., Springfield, Ill. (Vermiculite)
Jamar Co., Walker, Duluth, Minn.
Johns-Manville, New York, N. Y. (Asbestos, magnesia, rock cork)
Keasbey Co., Robert A., New York, N. Y. (Asbestos and cork)
Keasbey & Mattison Co., Ambler, Pa. (Asbestos, magnesia)
Masonite Corp., Chicago, Ill.
Mitchell & Smith, Inc., Detroit, Mich. (Cork)
Monsanto Chemical Co., Merimac Div., Everett, Mass.
● Mortell Co., J. W., Kankakee, Ill. (Plastic cork coating)
● Mundet Cork Corp., Brooklyn, N. Y. (Cork)
Munn and Steele, Inc., Newark, N. J.
National Gypsum Co., Buffalo, N. Y. (Moulded)
Norristown Magnesia & Asbestos Co., Norristown, Pa. (Asbestos, magnesia)
● Owens-Corning Fiberglas Corp., Toledo, O. (Sectional and flexible)
Pacific States Felt & Mfg. Co., Inc., San Francisco, Calif.
Plant Rubber & Asbestos Works, San Francisco, Calif.
Poe Co., C. W., Cleveland, O.
● Porter & Co., Inc., H. W., Newark, N. J. (Underground)
● Ric-wiL Co., Cleveland, O. (Underground)

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Robinson Insulation Co., Great Falls, Mont.
Ruberoid Co., New York, N. Y. (Asbestos, magnesia)
● Sall Mountain Co., Chicago, Ill. (Asbestos)
Schundler & Co., Inc., F. E., Long Island City, N. Y.
Smith & Kanzler Corp., Elizabeth, N. J. (Asbestos air cell, wool felt and hair felt)
Standard Asbestos Mfg. Co., Chicago, Ill.
Union Asbestos & Rubber Co., Cicero, Ill.
United Cork Companies, Lyndhurst, N. J.
Universal Zonolite Insulation Co., Chicago, Ill.
Walker Jamar Co., Duluth, Minn.
Western Mineral Products Co., Omaha, Nebr. (underground)
● Wilson, Inc., Grant, Chicago, Ill.
Wyckoff & Son Co., A., Elmira, N. Y. (Wood)

IONIZATION APPARATUS

Coroaire Heater Corp., The, Cleveland, O.
Electroaire Corp., Chicago, Ill.
Montgomery Bros., San Francisco, Calif.
Norwood Filtration Co., The, Florence, Mass.
United States Ozone Co. of America, Scottdale, Pa.

IRON BODY VALVES

See Valves, Gate; and Valves, Globe

JACKETED PIPE

See Pipe, Jacketed

JOINTS, PIPE, ELECTRICAL INSULATING

Barco Mfg. Co., Chicago, Ill.
Dresser Mfg. Co., Bradford, Pa.

JOINTS, PIPE, EXPANSION, PACKLESS

● American District Steam Co., North Tonawanda, N. Y.
Badger Fire Extinguisher Co., Somerville, Mass.
● Badger & Sons Co., E. B., Boston, Mass. (Corrugated copper, stainless steel)
Barco Mfg. Co., Chicago, Ill.
● Crane Co., Chicago, Ill.
Croll-Reynolds Engineering Co., Inc., New York, N. Y.
Foster Wheeler Corp., New York, N. Y.
● Fulton Sylphon Co., Knoxville, Tenn.
Harris & Co., Arthur, Chicago, Ill.
Kopperman & Sons, Joseph, Philadelphia, Pa.
National Valve & Mfg. Co., Pittsburgh, Pa.
Northern Indiana Brass Co., Elkhart, Ind.
Semet-Solvay Engineering Corp., New York, N. Y.
United States Rubber Co., New York, N. Y.
Zallea Brothers & Johnson, Wilmington, Del.

JOINTS, PIPE, EXPANSION, SLIP

● American District Steam Co., North Tonawanda, N. Y.
Belfield Co., H., Philadelphia, Pa.
Clow & Sons, James B., Chicago, Ill.
● Crane Co., Chicago, Ill.
Dresser Mfg. Co., Bradford, Pa.
Duriron Co., Inc., Dayton, O. (Acid resisting)
Howard Iron Works & Alberger Heater Co., Buffalo, N. Y.
● Illinois Engineering Co., Chicago, Ill.
Jarecki Mfg. Co., Erie, Pa.
Northern Indiana Brass Co., Elkhart, Ind.
Powell Co., Wm., Cincinnati, O.
Semet-Solvay Engineering Corp., New York, N. Y.
● Walworth Co., New York, N. Y.
Warren Foundry & Pipe Corp., New York, N. Y.
● Webster & Co., Warren, Camden, N. J.
● Yarnall-Waring Co., Philadelphia, Pa.

JOINTS, PIPE, FLEXIBLE SWING AND REVOLVING

Barco Mfg. Co., Chicago, Ill.
Bordo Co., Inc., L. J., Glenside, Pa.
Chicago Metal Hose Corp., Maywood, Ill.
● Crane Co., Chicago, Ill.
Flexo Supply Co., Inc., St. Louis, Mo.
Patterson-Ballagh Corp., Los Angeles, Calif.
Powell Co., Wm., Cincinnati, O.
Syntron Co., Homer City, Pa.
Water Cooling Corp., New York, N. Y.

JOINTS, UNIVERSAL, FOR OPERATING VALVES

Blood Brothers Machine Co., Allegan, Mich.
● Brooks Equipment Corp., New York, N. Y.
Consolidated Car-Heating Co., Inc., Albany, N. Y.
Newman Brothers, Inc., Cincinnati, O.
Stow Mfg. Co., Binghampton, N. Y. (flexible shafts)

KATA THERMOMETERS

See Thermometers, Kata

LACQUERS

See Enamels and Lacquers

LAMPS, STERILIZING, FOR DUCT INSTALLATION

General Electric Co., Lamp Dept., Nela Park, Cleveland, O.
Westinghouse Electric & Mfg. Co., Bloomfield, N. J.

LEAD PIPE

See Pipe and Tubing, Lead and Lead Alloy

LEAD SHEETS

See Sheets, Lead

LEAD TUBING

See Pipe and Tubing, Lead and Lead Alloy

LEAK DETECTORS

See Detectors, Leak, Refrigerant

LEATHER BELTING

See Belting, Flat, Leather

LEATHER PACKING

See Packing, Leather

LIGHTS, PILOT AND SIGNAL

Armstrong Heat Control Co., Portland, Ore.
Benjamin Electric Mfg. Co., Des Plaines, Ill.
Cooper Co., Clark, Palmyra, N. J.
Dial Light Co. of America, Inc., New York, N. Y.
● General Controls Co., Glendale, Calif.
General Electric Co., Lamp Dept., Nela Park, Cleveland, O.
Hart Mfg. Co., The, Hartford, Conn.
Signal Indicator Co., New York, N. Y.

LINKS, FUSIBLE

Century Fan & Ventilator Co., New York, N. Y.
● Grinnell Co., Inc., Providence, R. I.

LIQUID LEVEL GAGES

See Gages, Liquid Level

LIQUID LEVEL RECORDERS

See Recorders, Liquid Level

LIQUID PRESSURE REGULATORS

See Regulators, Pressure, Liquid

LOCK FORMING MACHINES

See Machines, Pittsburgh Lock Forming

LOCK NUTS

See Nuts, Lock

LOUVERS AND SHUTTERS, AUTOMATICALLY OR MANUALLY CONTROLLED

Air Conditioning Products Co., Detroit, Mich.
Air Control Products, Inc., Coopersville, Mich.
Air Controls, Inc., Cleveland, O.
Airmaster Corp., Chicago, Ill.
● Allen Corp., Detroit, Mich.
American Coolair Corp., Jacksonville, Fla.
American Foundry & Furnace Co., Bloomington, Ill.
American Warming & Ventilating Co., Toledo, O.
Ames Co., W. R., San Francisco, Calif.
Arex Co., Chicago, Ill.
● Barber-Colman Co., Rockford, Ill.
Belanger Fan & Blower Co., Detroit, Mich.
Belco Exhaust Fan Mfg. Co., St. Louis, Mo.
Bishop & Babcock Mfg. Co., Cleveland, O.
● Buffalo Forge Co., Buffalo, N. Y.
Burt Mfg. Co., Akron, O.
Campbell Heating Co., E. K., Kansas City, Mo.
Champion Blower & Forge Co., Lancaster, Pa.
● Chelsea Fan & Blower Co., Irvington, N. J.
Chicago Metal Mfg. Co., Chicago, Ill.
Circulators & Devices Mfg. Corp., New York, N. Y.
Clay Equipment Corp., Cedar Falls, Ia.
Decatur Iron & Steel Co., Decatur, Ala.
Dual Air Fan Co., Chicago, Ill.
Economy Electric Mfg Co., Chicago, Ill.
Electrovent Fan & Mfg. Co., Chicago, Ill.
Elgo Shutter & Mfg. Co., Detroit, Mich.
Gillian Mfg. Co., Detroit, Mich.
Guth Co., Edwin F., St. Louis, Mo.
Hirschman Co., W. F., Buffalo, N. Y.
International Engineering, Inc., Dayton, O.
International Steel Co., Evansville, Ind.
Jamieson Mfg. Co., Dallas, Tex.
● Johnson Fan & Blower Corp., Chicago, Ill.
Johnson Co., William W., Dayton, O.
Jordan & Co., Paul R., Indianapolis, Ind.
Kelvin-White Co., Boston, Mass.
King Ventilating Co., Owatonna, Minn.
Kirk & Blum Mfg. Co., Cincinnati, O.
Klee Co., Geo. B., Cincinnati, O.
Lau Blower Co., Dayton, O.
Leslie Welding Co., Chicago, Ill.
Lockjoint Wood Products Co., Wichita, Kans. (Wood; stationary door, wall, window and ceiling)
Lohman Co., Wm. J., Irvington, N. J.
Maysteel Products, Inc., Mayville, Wis.

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- Meier Electric & Machine Co., Indianapolis, Ind.
- Meyer Mfg. Co., Detroit, Mich.
- ● Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
- Myers Electric Co., Inc., Pittsburgh, Pa.
- ● Nelson Corp., Herman, Moline, Ill.
- Peerless Electric Co., Warren, O.
- Reed Unit-Fans, Inc., New Orleans, La.
- Riggin Metal Products, Inc., Kankakee, Ill.
- Robertson Co., H. H., Pittsburgh, Pa.
- Schoedinger, F. O., Columbus, O.
- Signal Electric Mfg. Co., Menominee, Mich.
- Standard Stamping & Perforating Co., Chicago, Ill.
- Supreme Heater & Ventilating Corp., St. Louis, Mo. (Oscillating)
- ● Tuttle & Bailey, Inc., New Britain, Conn.
- United States Register Co., Battle Creek, Mich.
- Utility Fan Corp., Los Angeles, Calif.
- Van Noorden Co., E., Boston, Mass.
- Victor Electric Products, Inc., Cincinnati, O.
- Waterloo Register Co., Waterloo, Ia.

LOW WATER CUT-OFFS

See Cut-Offs, Low Water, Heating Boiler

MACHINES, BLUE PRINT AND WHITE PRINT

For Reproducing Engineering Drawings

- American Photocopy Equipment Co., Chicago, Ill.
- Bruning Co., Inc., Charles, Long Island City, N. Y.
- Ozalid Products Div., General Aniline & Film Corp., Johnson City, N. Y.
- Paragon-Revolute Corp., Rochester, N. Y.
- Pease Co., C. F., The, Chicago, Ill.
- Peck & Harvey, Chicago, Ill.
- Wickes Brothers, Saginaw, Mich.

MACHINES AND FILM, X-RAY

- Eastman Kodak Co., Rochester, N. Y.
- Kelly-Koet, Covington, Ky.
- Westinghouse Electric & Mfg Co., X-Ray Div., Baltimore, Md.

MACHINES, PIPE CUTTING AND THREADING, PORTABLE

- ● Air Reduction Sales Co., New York, N. Y. (Cutting and beveling)
- Beaver Pipe Tools, Inc., Warren, O.
- Curtis & Curtis Co., The, Bridgeport, Conn.
- Landis Machine Co., Inc., Waynesboro, Pa.
- Linde Air Products Co., The, New York, N. Y. (Cutting and beveling)
- National Machine Works, Chicago, Ill.
- Nye Tool & Machine Co., Chicago, Ill.
- Oster Mfg. Co., Cleveland, O.
- Ridge Tool Co., Elyria, O. (Hand)
- Toledo Pipe Threading Machine Co., Toledo, O.

MACHINES, PIPE CUTTING AND THREADING, STATIONARY

- Beaver Pipe Tools, Inc., Warren, O.
- Bignall & Keeler Machine Wks., Edwardsville, Ill.
- Curtis & Curtis Co., The, Bridgeport, Conn.
- Jarecki Mfg. Co., Erie, Pa.
- Landis Machine Co., Inc., Waynesboro, Pa.
- Merrell Mfg. Co., Toledo, O.
- Oster Mfg. Co., Cleveland, O.
- Pines Engineering Co., Inc., Aurora, Ill.
- Saunders Machine & Tool Corp., Yonkers, N. Y.
- Spence Engineering Co., Inc., Walden, N. Y. (Beveling and cutting machine)
- Toledo Pipe Threading Machine Co., Toledo, O.

MACHINES, PITTSBURGH LOCK FORMING

- Lockformer Co., Chicago, Ill.
- Maplewood Machinery Co., Inc., Chicago, Ill.
- Rafter Machine Co., Belleville, N. J.

MACHINES, REFRIGERATION, ABSORPTION

- Vogt Machine Co., Henry, Louisville, Ky.
- Williams Oil-O-Matic Heating Corp , Bloomington, Ill.
- ● Worthington Pump & Machinery Corp., Air Conditioning and Refrigeration Div., Harrison, N. J.
- York Corp., York, Pa.

MACHINES, VERTICAL, THREADING AND BORING

- ● Bullard Co., The, Bridgeport, Conn.

MAGNESIUM ALLOY SHEETS

See Sheets, Magnesium Alloy

MALLEABLE UNIONS

See Unions, Malleable

MANIFOLDS, REFRIGERATION

- Frick Co., Waynesboro, Pa.
- Imperial Brass Mfg. Co., Chicago, Ill.
- Kerotest Mfg. Co., Pittsburgh, Pa.
- Mueller Brass Co., Port Huron, Mich.
- Superior Valve and Fittings Co., Pittsburgh, Pa.
- Vilter Mfg. Co., Milwaukee, Wis.
- Weatherhead Co., Cleveland, O.
- York Corp., York, Pa.

MANOMETERS

- Bacharach Industrial Instrument Co., Pittsburgh, Pa.
- Brown Instrument Co., Div. of Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.
- ● Builders-Providence, Inc., Div. of Builders Iron Foundry, Providence, R. I.
- Defender Automatic Regulator Co., St. Louis, Mo.
- Detroit Air Meter Co., Detroit, Mich.
- Dwyer Mfg. Co., F. W., Chicago, Ill.
- Fischer & Porter Co., Hatboro, Pa.
- Friez Instrument Div., Bendix Aviation Corp., Towson, Md.
- ● Hays Corp., Michigan City, Ind.
- Hill, E. Vernon, Chicago, Ill.
- Huyette Co., Inc., Paul B., Philadelphia, Pa.
- Meriam Co., The, Cleveland, O.
- Morey & Jones, Ltd., Los Angeles, Calif.
- Precision Thermometer & Instrument Co., Philadelphia, Pa.
- Republic Flow Meters Co., Chicago, Ill.
- Scientific Instrument Co., Detroit, Mich.
- Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
- Taylor Instrument Companies, Rochester, N. Y.
- Trerice Co., H. O., Detroit, Mich.

MECHANICAL DRIVE TURBINES

See Turbines, Mechanical Drive

MECHANICAL SPEED CHANGERS

See Changers, Speed, Mechanical

MECHANICAL TRAPS

See Traps, Steam, Mechanical

MERCURY SWITCHES

See Switches, Mercury

METAL HOSE

See Hose, Metal, for Eliminating Compressor Vibration

METALLIC PACKING

See Packing, Metallic

METERS, AIR VELOCITY, DIRECT READING

- Detroit Air Meter Co., Detroit, Mich.
- ● Hays Corp., Michigan City, Ind.
- ● Illinois Testing Laboratories, Inc., Chicago, Ill.
- Taylor Instrument Companies, Rochester, N. Y.

METERS, CONDENSATION

- ● American District Steam Co., North Tonawanda, N. Y.
- Buffalo Meter Co., Buffalo, N. Y.
- Central Station Steam Co., Detroit, Mich.
- Cochrane Corp., Philadelphia, Pa.
- Neptune Meter Co., New York, N. Y.
- Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
- Worthington-Gamon Meter Co., Harrison, N. J.

METERS, FLOW, REFRIGERANT

- Bristol Co., Waterbury, Conn.
- ● Builders-Providence, Inc., Div. of Builders Iron Foundry, Providence, R. I.
- Fischer & Porter Co., Hatboro, Pa.
- Neptune Meter Co., New York, N. Y.

METERS, FLOW, STEAM

- ● American District Steam Co., North Tonawanda, N. Y.
- American Meter Co., New York, N. Y.
- Bailey Meter Co., Cleveland, O.
- Bristol Co , Waterbury, Conn.
- Brown Instrument Co., Div. of Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.
- ● Builders-Providence, Inc., Div. of Builders Iron Foundry, Providence, R. I.
- Cochrane Corp., Philadelphia, Pa.
- Fischer & Porter Co., Hatboro, Pa.
- Foxboro Co., Foxboro, Mass.
- Huyette Co., Inc., Paul B., Philadelphia, Pa.
- ● Leeds & Northrup Co., Philadelphia, Pa.
- Mason-Neilan Regulator Co., Boston, Mass.
- Meriam Co., The, Cleveland, O.
- Morey & Jones, Ltd., Los Angeles, Calif.
- Republic Flow Meters Co., Chicago, Ill.
- Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
- Taylor Instrument Companies, Rochester, N. Y.

METERS, PROCESS LIQUID

- American Meter Co., Inc., New York, N. Y.
- Bailey Meter Co., Cleveland, O.
- Bowser, Inc., Fort Wayne, Ind.

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Bristol Co., Waterbury, Conn.
Brown Instrument Co., Div. of Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.
Buffalo Meter Co., Buffalo, N. Y.
● Builders-Providence, Inc., Div. of Builders Iron Foundry, Providence, R. I.
Cochrane Corp., Philadelphia, Pa.
Fischer & Porter Co., Hatboro, Pa.
Foxboro Co., Foxboro, Mass.
Mason-Neilan Regulator Co., Boston, Mass.
Meriam Co., The, Cleveland, O.
Morey & Jones, Ltd., Los Angeles, Calif.
Neptune Meter Co., New York, N. Y.
Pittsburgh Equitable Meter Co., Pittsburgh, Pa.
Republic Flow Meters Co., Chicago, Ill.
Roots-Connersville Blower Corp., Connersville, Ind.
Schutte & Koerting Co., Philadelphia, Pa.
Taylor Instrument Companies, Rochester, N. Y.
Worthington-Gamon Meter Co., Harrison, N. J.

METERS, VOLUME, AIR AND GAS

American Meter Co., Inc., New York, N. Y.
Bristol Co., The, Waterbury, Conn.
Fischer & Porter Co., Hatboro, Pa.
● Hays Corp., Michigan City, Ind.
Pittsburgh Equitable Meter Co., Pittsburgh, Pa.
Roots-Connersville Blower Corp., Connersville, Ind.
Selas Co., The, Philadelphia, Pa.

METERS, WATER

Bailey Meter Co., Cleveland, O.
Buffalo Meter Co., Buffalo, N. Y.
● Builders-Providence, Inc., Div. of Builders Iron Foundry, Providence, R. I.
Fischer & Porter Co., Hatboro, Pa.
Huyette Co., Inc., Paul B., Philadelphia, Pa.
Morey & Jones, Ltd., Los Angeles, Calif.
National Meter Co., Brooklyn, N. Y.
Neptune Meter Co., New York, N. Y.
Pfening Co., Fred D., Columbus, O. (batch measuring)
Pittsburgh Equitable Meter Co., Pittsburgh, Pa.
Republic Flow Meters Co., Chicago, Ill.
Roots-Connersville Blower Corp., Connersville, Ind.
Union Water Meter Co., Worcester, Mass.
Worthington-Gamon Meter Co., Harrison, N. J.

MIXING VALVES

See Valves, Mixing, Steam and Water

MODULATING VALVES

See Valves, Radiator, Steam and Hot Water

MOTOR BASES

See Bases and Pads, Vibration Isolating; Bases, Motor, Tension Adjusting

MOTOR CONTROLLERS

See Controllers and Starters, Motor

MOTOR OPERATED VALVES

See Valves, Motor Operated

MOTOR STARTERS

See Controllers and Starters, Motor

MOTORS, ELECTRIC, FRACTIONAL HP

Baldor Electric Co., St. Louis, Mo.
● Barber-Colman Co., Rockford, Ill.
Bodine Electric Co., Chicago, Ill.
Brown-Brockmeyer Co., Dayton, O.
Canatsey Electric Mfg. Co., Kansas City, Mo.
Century Electric Co., St. Louis, Mo.
Delco Appliance Div., General Motors Corp., Rochester, N. Y.
Delco Products Div., General Motors Corp., Dayton, O.
Diehl Mfg. Co., Somerville, N. J.
Dynamic Air Engineering, Inc., Los Angeles, Calif.
Eastern Air Devices, Inc., Brooklyn, N. Y.
Emerson Electric Mfg. Co., The, St. Louis, Mo.
Fairbanks, Morse & Co., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
● Hansen Mfg. Co., Inc., Princeton, Ind.
● Holtzer-Cabot Electric Co., Boston, Mass.
Howell Electric Motors Co., Howell, Mich.
Janette Mfg. Co., Chicago, Ill.
● Leland Electric Co., Dayton, O.
Marathon Electric Mfg. Corp., Wausau, Wis.
Master Electric Co., Dayton, O.
Ohio Electric Mfg. Co., Cleveland, O.
Peerless Electric Co., Warren, O.
Reynolds Electric Co., Chicago, Ill.
Robbins & Myers, Inc., Springfield, O.
Russell Electric Co., Chicago, Ill.
Signal Electric Mfg. Co., Menominee, Mich.
Small Motors, Inc., Chicago, Ill.
Smith Mfg. Co., Inc., F. A., Rochester, N. Y.
Speedway Mfg. Co., Chicago (Cicero), Ill.
● Star Electric Motor Co., Bloomfield, N. J.
Sterling Electric Motors, Inc., Los Angeles, Calif.
Sturtevant Co., B. F., Boston, Mass.
U. S. Electrical Motors, Inc., Los Angeles, Calif.
Victor Electric Products, Inc., Cincinnati, O.
Wagner Electric Corp., St. Louis, Mo.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

MOTORS, ELECTRIC, 1 HP AND OVER

● Allis Co., Louis, The, Milwaukee, Wis.
● Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Baldor Electric Co., St. Louis, Mo.
Bogue Electric Co., Paterson, N. J.
Brown-Brockmeyer Co., Dayton, O.
Burke Electric Co., Erie, Pa.
Byron Jackson Co., Los Angeles, Calif. (Submersible)
Canatsey Electric Mfg. Co., Kansas City, Mo.
Century Electric Co., St. Louis, Mo.
Continental Electric Co., Inc., Newark, N. J.
● Crocker-Wheeler Elec. Mfg. Co. Div., Joshua Hendy Iron Works, Ampere, N. J.
Delco Products Div., General Motors Corp., Dayton, O.
Diehl Mfg. Co., Somerville, N. J.
Electric Machinery Mfg. Co., Minneapolis, Minn.
Emerson Electric Mfg. Co., The, St. Louis, Mo.
Fairbanks, Morse & Co., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Howell Electric Motors Co., Howell, Mich.
Ideal Electric & Mfg. Co., Mansfield, O.
Imperial Electric Co., Akron, O.
Jackson Co., Byron, Los Angeles, Calif. (Submersible)
Janette Mfg. Co., Chicago, Ill.
● Leland Electric Co., Dayton, O.
Marathon Electric Mfg. Corp., Wausau, Wis.
Marble-Card Electric Co., Gladstone, Mich.
Master Electric Co., Dayton, O.
Peerless Electric Co., Warren, O.
Philadelphia Gear Works, Inc., Philadelphia, Pa. (Geared)
Reliance Electric & Engineering Co., Cleveland, O.
Robbins & Myers, Inc., Springfield, O.
● Star Electric Motor Co., Bloomfield, N. J.
Sterling Electric Motors, Inc., Los Angeles, Calif.
Sturtevant Co., B. F., Boston, Mass.
U. S. Electric Motors, Inc., Los Angeles, Calif.
Wagner Electric Corp., St. Louis, Mo.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

MUSHROOM VENTILATORS

See Ventilators, Mushroom

NEEDLE VALVES

See Valves, Needle

NEUTRALIZERS, ACID

See Dehydrant and Acid Neutralizer

NICKEL AND NICKEL ALLOY PIPE AND FITTINGS

See Tubing, Nickel and Alloy; Fittings, Pipe, Nickel and Nickel Alloy; Pipe, Nickel and Nickel Alloy

NICKEL AND NICKEL ALLOY SHEETS

See Sheets, Nickel and Nickel Alloy

NIPPLES, PIPE, BRASS AND COPPER

Acheson Mfg. Co., Rankin, Pa.
Chase Brass & Copper Co., Waterbury, Conn.
Chicago Nipple Mfg. Co., Chicago, Ill.
Conklin Brass & Copper Co., Inc., T. E., New York, N. Y.
● Crane Co., Chicago, Ill.
Downs-Smith Brass & Copper Co., New York, N. Y.
● Ellsworth Pipe & Supply Co., Milwaukee, Wis.
Grabler Mfg. Co., Cleveland, O.
● Grinnell Co., Inc., Providence, R. I.
Imperial Brass Mfg. Co., Chicago, Ill.
Mueller Brass Co., Port Huron, Mich.
Penn Mfg. Corp. of Washington, Pa., Washington, Pa.
Sales & Co., Murray W., Detroit, Mich.
● Walworth Co., New York, N. Y.
Ward Foundries, Inc., J. P., Blossburgh, Pa.
Weatherhead Co., Cleveland, O.

NIPPLES, PIPE, IRON AND STEEL

Alabama Pipe Co., Anniston, Ala. (Cast iron)
Alloy Steel Products Co., Linden, N. J. (Stainless steel)
● Byers Co., A. M., Pittsburgh, Pa. (Wrought iron)
Chicago Nipple Mfg. Co., Chicago, Ill.
Clow & Sons, James B., Chicago, Ill.
Colonial Alloys Co., Metals Div., Philadelphia, Pa. (Stainless)
● Crane Co., Chicago, Ill.
Detroit Brass & Malleable Wks., Detroit, Mich.
Dresser Mfg. Co., Bradford, Pa. (Swage)
● Ellsworth Pipe & Supply Co., Milwaukee, Wis.
● Flori Pipe Co., The, St. Louis, Mo.
Grabler Mfg. Co., Cleveland, O.
● Grinnell Co., Inc., Providence, R. I.
Hasco Valve & Machine Co., Milwaukee, Wis.
Illinois Malleable Iron Co., Chicago, Ill.
Larkin Packer Co., St. Louis, Mo.

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- Penn Mfg. Corp. of Washington, Pa., Washington, Pa.
- Plumb Mfg. Co., Utica, N. Y.
- Sales & Co., Murray W., Detroit, Mich.
- ● Walworth Co., New York, N. Y.
- Ward Foundries, Inc., J. P., Blossburgh, Pa.

NOISE ELIMINATORS

See Bases and Pads, Vibration Isolating; Hose, Metal, for Eliminating Compressor Vibration; Insulation, Sound Deadening

NOZZLES, SPRAY

- American Cooling Tower Co., Kansas City, Mo.
- American-LaFrance-Foamite Corp., Elmira, N. Y.
- American Molded Products Co., Chicago, Ill.
- April Showers Co., Washington, D. C.
- Bahnson Co., Winston-Salem, N. C.
- Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
- Bayley Blower Co., Milwaukee, Wis.
- Benjamin Air Rifle Co., St. Louis, Mo.
- Betz Engineering Co., Kansas City, Mo.
- Binks Mfg. Co., Chicago, Ill.
- Blower Application Co., Milwaukee, Wis.
- ● Buffalo Forge Co., Buffalo, N. Y.
- Chain Belt Co., Milwaukee, Wis.
- ● Clarage Fan Co., Kalamazoo, Mich.
- Corning Glass Works, Corning, N. Y. (Glass)
- DeVilbiss Co., The, Toledo, O.
- Dustlix Corp., Milwaukee, Wis.
- Fluor Corp., Ltd., The, Los Angeles, Calif.
- International Moistening Co., Providence, R. I.
- ● Link-Belt Co., Chicago, Ill.
- Lonn Mfg. Co., Inc., Chicago, Ill.
- ● Marley Co., Kansas City, Kans.
- ● Martocello & Co., Jos. A., Philadelphia, Pa.
- Milburn Co., Alexander, Baltimore, Md.
- Monarch Mfg. Wks., Inc., Philadelphia, Pa.
- Parks-Cramer Co., Fitchburg, Mass.
- Phillips Cooling Tower Co., Inc., New York, N. Y.
- Plummer Spray Equipment Co., Napoleon, O.
- Rega Mfg. Co., Rochester, N. Y.
- Ross Heater & Mfg. Co., Inc., Buffalo, N. Y.
- Ross Sprinkler Co., Pasadena, Calif.
- Schubert-Christy Corp., Indio, Calif.
- Schutte & Koerting Co., Philadelphia, Pa.
- Skinner Irrigation Co., Troy, O.
- Spray Engineering Co., Somerville, Mass.
- ● Spraying Systems Co., Chicago, Ill.
- Strandwitz & Co., Inc., W. J., Camden, N. J.
- Sturtevant Co., B. F., Boston, Mass.
- Supreme Electric Products Corp., Rochester, N. Y.
- Water Cooling Corp., New York, N. Y.
- Water Cooling Equipment Corp., St. Louis, Mo.
- ● Yarnall-Waring Co., Philadelphia, Pa.

NUTS, LOCK

- Conklin Brass & Copper Co., Inc., T. E., New York, N. Y.
- Elastic Stop Nut Corp., Union, N. J.
- ● Flori Pipe Co., The, St. Louis, Mo.
- ● Grinnell Co., Inc., Providence, R. I.
- Kwikon Co., Chicago, Ill.
- Lamson & Sessions Co., Cleveland, O.
- Locknut Corp. of America, Chicago, Ill.
- MacLean-Fogg Lock Nut Co., Chicago, Ill.
- Malleable Iron Fittings Co., Branford, Conn.
- Palnut Co., Irvington, N. J.
- Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
- Ryerson & Son, Inc., Jos. T., Chicago, Ill.
- Standard Pressed Steel Co., Jenkintown, Pa.
- ● Walworth Co., New York, N. Y.
- Ward Foundries, Inc., J. P., Blossburgh, Pa.

OBSERVATION BOILER PORTS

See Ports, Observation, Boiler

ODOR ADSORBERS

See Filters, Air; Adsorbers, Odor

ODOR NEUTRALIZERS

See Adsorbers, Odor

OIL BURNERS

See Burners, Oil

OIL COOLERS

See Coolers, Oil

OIL FIRED UNIT HEATERS

See Heaters, Unit, Oil Fired

OIL SEPARATORS

See Separators, Steam and Oil

OPEN END WRENCHES

See Wrenches, Open End

OPERATORS, DAMPER, DUCT

- Au-Temp-Co Corp., New York, N. Y.
- ● Automatic Products Co., Milwaukee, Wis.
- Automatic Temperature Control Co., Inc., Philadelphia, Pa.
- ● Barber-Colman Co., Rockford, Ill.
- Bristol Co., The, Waterbury, Conn.
- Cook Electric Co., Chicago, Ill.
- Friez Instrument Div., Bendix Aviation Corp., Towson, Md.
- ● Fulton Sylphon Co., Knoxville, Tenn.
- ● General Controls Co., Glendale, Calif.
- ● Hotstream Heater Co., Cleveland, O.
- ● Johnson Service Co., Milwaukee, Wis.
- Mason-Nielan Regulator Co., Boston, Mass.
- ● Mercoid Corp., The, Chicago, Ill.
- ● Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
- Perfex Corp., Milwaukee, Wis.
- ● Powers Regulator Co., Chicago, Ill.
- Sampsel Time Control, Inc., Spring Valley, Ill.
- ● Sarcotherm Controls, Inc., Chicago, Ill.
- Shallcross Controls, Inc., Milwaukee, Wis.
- Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
- Taylor Instrument Companies, Rochester, N. Y.
- Young Regulator Co., Cleveland, O.

OPERATORS, VALVE

- Au-Temp-Co Corp., New York, N. Y.
- Automatic Temperature Control Co., Inc., Philadelphia, Pa
- ● Barber-Colman Co., Rockford, Ill.
- Bristol Co., Waterbury, Conn.
- Brooke Engineering Co., Inc., Philadelphia, Pa.
- Cook Electric Co., Chicago, Ill.
- Cooper Co., Clark, Palmyra, N. J.
- ● Crane Co., Chicago, Ill.
- Cutler-Hammer, Inc., Milwaukee, Wis.
- Foxboro Co., Foxboro, Mass.
- ● Fulton Sylphon Co., Knoxville, Tenn.
- ● General Controls Co., Glendale, Calif.
- Hercules Electric & Mfg. Co., Inc., Brooklyn, N. Y.
- ● Johnson Service Co., Milwaukee, Wis.
- Mason-Neilan Regulator Co., Boston, Mass.
- ● McDonnell & Miller, Chicago, Ill.
- ● Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
- Perfex Corp., Milwaukee, Wis.
- ● Powers Regulator Co., Chicago, Ill.
- Shallcross Controls, Inc., Milwaukee, Wis.
- Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
- Taylor Instrument Companies, Rochester, N. Y.
- Tomlee Tool & Engineering Co., Minneapolis, Minn.

ORIFICES, RADIATOR

- Armstrong Heat Control Co., Portland, Ore.
- Au-Temp-Co Corp., New York, N. Y.
- Barnes & Jones, Inc., Jamaica Plain, Boston, Mass.
- ● Dunham Co., C. A., Chicago, Ill.
- ● Haines & Co., William S., Philadelphia, Pa.
- ● Illinois Engineering Co., Chicago, Ill.
- New York Air Valve Corp., New York, N. Y.
- ● Sarco Co., Inc., New York, N. Y.
- ● Sterling, Inc., Milwaukee, Wis.
- Tallmadge & Co., Webster, East Orange, N. J.
- ● Thrush & Co., H. A., Peru, Ind.
- ● Webster & Co., Warren, Camden, N. J.
- Webster Tallmadge & Co., East Orange, N. J.

OXY-ACETYLENE WELDING

See Welding and Cutting Apparatus, Oxy-Acetylene

OZONE APPARATUS

- Automatic Pump & Softener Corp., Rockford, Ill.
- ● Chelsea Fan & Blower Co., Irvington, N. J.
- Coroaire Heater Corp., The, Cleveland, O.
- Electroaire Corp., Chicago, Ill.
- Lohman Co., Wm. J., Irvington, N. J.
- Montgomery Bros., San Francisco, Calif.
- Norwood Filtration Co., The, Florence, Mass.
- Ozone Air Co., Grand Rapids, Mich.
- Sealkote Corp., Chicago, Ill.
- United States Ozone Co. of America, Scottdale, Pa.

PACKING, ASBESTOS

- Acme Asbestos Coverings & Flooring Co., Chicago, Ill.
- Allpax Co., Inc., Mamaroneck, N. Y.
- Anchor Packing Co., Philadelphia, Pa.
- Austin-Mason Co., New York, N. Y.
- Belmont Packing & Rubber Co., The, Philadelphia, Pa.
- ● Carey Mfg. Co., Philip, Lockland, Cincinnati, O.
- Chicago Specialty Mfg. Co., Chicago, Ill.
- Crane Packing Co., Chicago, Ill.
- Darcoid Co., Inc., New York, N. Y.
- Durabla Mfg. Co., New York, N. Y.
- Ehret Magnesia Mfg. Co., Valley Forge, Pa.
- Felt Prdoucts Mfg. Co., Chicago, Ill.
- Garlock Packing Co., Palmyra, N. Y.
- Goetze Gasket & Packing Co., Inc., New Brunswick, N. J.
- Goodyear Tire & Rubber Co., Akron, O.
- ● Grant Wilson, Inc., Chicago, Ill.
- Greene, Tweed & Co., New York, N. Y.
- ● Jenkins Bros., New York, N. Y.

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Johns-Manville, New York, N. Y.
Keasbey Co., Robert A., New York, N. Y.
Keasbey & Mattison Co., Ambler, Pa.
Klingerit, Inc., New York, N. Y. (Sheet and rod)
Linear Packing & Rubber Co., Inc., Philadelphia, Pa.
Metallo Gasket Co., New Brunswick, N. J.
Pacific States Felt & Mfg. Co., Inc., San Francisco, Calif.
Plant Rubber & Asbestos Works, San Francisco, Calif.
Quaker Rubber Corp., Philadelphia, Pa.
● Sall Mountain Co., Chicago, Ill.
Thermoid Rubber, Div. of Thermoid Co., Trenton, N. J.
Union Asbestos & Rubber Co., Cicero, Ill.
United States Rubber Co., New York, N. Y.
● Wilson, Inc., Grant, Chicago, Ill.

PACKING, FIBER

Anchor Packing Co., Philadelphia, Pa.
Austin-Mason Co., New York, N. Y.
Belmont Packing & Rubber Co., The, Philadelphia, Pa.
Darcoid Co., Inc., New York, N. Y.
Durabla Mfg. Co., New York, N. Y.
Ehret Magnesia Mfg. Co., Valley Forge, Pa.
Endura Mfg. Corp., Quakertown, Pa.
Garlock Packing Co., Palmyra, N. Y.
Goetze Gasket & Packing Co., Inc., New Brunswick, N. J.
● Jenkins Bros., New York, N. Y.
Johns-Manville, New York, N. Y.
Keasbey Co., Robert A., New York, N. Y.
Linear Packing & Rubber Co., Inc., Philadelphia, Pa.
McQuay-Norris Mfg. Co., St. Louis, Mo.
Metallo Gasket Co., New Brunswick, N. J.
Pacific States Felt & Mfg. Co., Inc., San Francisco, Calif.
Plant Rubber & Asbestos Works, San Francisco, Calif.
Quaker Rubber Corp., Philadelphia, Pa.
Thermoid Rubber, Div. of Thermoid Co., Trenton, N. J.
Union Asbestos & Rubber Co., Cicero, Ill.
United States Rubber Co., New York, N. Y.

PACKING, LEATHER

Alexander Bros., Philadelphia, Pa.
Belmont Packing & Rubber Co., The, Philadelphia, Pa.
Chicago Belting Co., Chicago, Ill.
Excelsior Leather Washer Mfg. Co., Rockford, Ill.
Graton & Knight Co., Worcester, Mass.
Houghton & Co., E. F., Philadelphia, Pa.
Pacific States Felt & Mfg. Co., Inc., San Francisco, Calif.
Plant Rubber & Asbestos Works, San Francisco, Calif.
● Rhoads & Sons, J. E., Philadelphia, Pa.
Schieren Co., Chas. A., New York, N. Y.
Watson-Stillman Co., Roselle, N. J.
Wayne Davies & Co., Chicago, Ill.
Williams & Son, I. B., Dover, N. H.

PACKING, METALLIC

Allpax Co., Inc., Mamaroneck, N. Y.
Alpha Metal & Rolling Mills, Inc., Brooklyn, N. Y.
Anchor Packing Co., Philadelphia, Pa.
Austin-Mason Co., New York, N. Y.
Belmont Packing & Rubber Co., The, Philadelphia, Pa.
Conneaut Packing Co, Conneaut, O.
Crane Packing Co., Chicago, Ill.
Darcoid Co., Inc., New York, N. Y.
Felt Products Mfg. Co., Chicago, Ill.
France Packing Co., Tacony, Philadelphia, Pa.
Garlock Packing Co., Palmyra, N. Y.
Goetze Gasket & Packing Co., Inc., New Brunswick, N. J.
Hound Packing Co., Chicago, Ill.
Johns-Manville, New York, N. Y.
Klingerit, Inc., New York, N. Y. (Sheet & rod)
Linear Packing & Rubber Co., Inc., Philadelphia, Pa.
McQuay-Norris Mfg. Co., St. Louis, Mo.
National Engineering Products, Inc., Washington, D. C.
National Lead Co., New York, N. Y.
Pacific States Felt & Mfg. Co., Inc., San Francisco, Calif.
Plant Rubber & Asbestos Works, San Francisco, Calif.
Quaker Rubber Corp., Philadelphia, Pa.
Rotary Seal Co., Chicago, Ill.
Union Asbestos & Rubber Co., Cicero, Ill.
United States Rubber Co., New York, N. Y.

PACKING, RUBBER AND SYNTHETIC

Anchor Packing Co., Philadelphia, Pa.
Austin-Mason Co., New York, N. Y.
Belmont Packing & Rubber Co., The, Philadelphia, Pa.
Boston Woven Hose & Rubber Co., Cambridge, Mass.
Chicago Belting Co., Chicago, Ill.
Chicago Specialty Mfg. Co., Chicago, Ill.
Continental Rubber Wks., Erie, Pa.
Crane Packing Co., Chicago, Ill.
Darcoid Co., Inc., New York, N. Y.
Ehret Magnesia Mfg. Co., Valley Forge, Pa.
Garlock Packing Co., Palmyra, N. Y.
Gates Rubber Co., Denver, Colo.
Goodrich Co., B. F., Akron, O.
Goodyear Tire & Rubber Co., Akron, O.
Graton & Knight Co., Worcester, Mass.
Hamilton Rubber Mfg. Co., Trenton, N. J.
● Jenkins Bros., New York, N. Y.
Johns-Manville, New York, N. Y.
Keasbey & Mattison Co., Ambler, Pa.
Linear Packing & Rubber Co., Inc., Philadelphia, Pa.
Manhattan Rubber Mfg. Co., Div. of Raybestos-Manhattan Inc., Passaic, N. J.
Pacific States Felt & Mfg. Co., Inc., San Francisco, Calif.
Plant Rubber & Asbestos Works, San Francisco, Calif.
Quaker Rubber Corp., Philadelphia, Pa.
Republic Rubber Div., Lee Rubber & Tire Corp., Youngstown, O
Thermoid Rubber, Div. of Thermoid Co., Trenton, N. J.
Union Asbestos & Rubber Co., Cicero, Ill.
United States Rubber Co., New York, N. Y.
United States Stoneware Co., New York, N. Y.

PANELS, PERFORATED, FOR AIR DIFFUSION

Pyle-National Co., The, Chicago, Ill.
Simplex Ceiling Co., New York, N. Y.

PARTS FOR HEATING AND AIR CONDITIONING EQUIPMENT

Ackermann Mfg. Co., Wheeling, W. Va.
● Carey Mfg. Co., Philip, Cincinnati, O. (Insulating panel for housing and duct construction)
Commercial Shearing & Stamping Co., Youngstown, O. (Tank heads and bottoms, water heater legs, furnace stampings, etc.)
● Detroit Stamping Co., Detroit, Mich.
Geuder, Paeschke & Frey Co., Milwaukee, Wis.
Lindsay and Lindsay, Chicago, Ill. (Cabinet construction for air conditioning and warm air heating equipment)
Mueller Brass Co., Port Huron, Mich. (Specially fabricated copper tubing, machine formed tubes)
Technical Ply-Woods, Chicago, Ill. (Plywood panel boards)

PILLOW BLOCK BEARINGS

See Bearings, Pillow Block

PILOT LIGHTS

See Lights, Pilot and Signal

PIPE, ALUMINUM

See Tubing, Aluminum

PIPE, ASBESTOS FIBER AND CEMENT

● Carey Mfg. Co., Philip, Lockland, Cincinnati, O.
Johns-Manville, New York, N. Y.
Keasbey & Mattison Co., Ambler, Pa.
Ruberoid Co., New York, N. Y.
Union Asbestos & Rubber Co., Cicero, Ill.
United States Stoneware Co., New York, N. Y.

PIPE BENDERS

See Benders, Pipe

PIPE, BRASS AND COPPER

● American Brass Co., Waterbury, Conn.
Bridgeport Brass Co., Bridgeport, Conn.
Chase Brass & Copper Co., Waterbury, Conn.
Conklin Brass & Copper Co., Inc., T. E., New York, N. Y.
Downs-Smith Brass & Copper Co., New York, N. Y.
Hussey & Co., C. G., Pittsburgh, Pa.
Lewin-Mathes Co., Lewin Metals Div., St. Louis, Mo.
Mueller Brass Co., Port Huron, Mich.
Revere Copper and Brass, Incorporated, New York, N. Y.
Wolverine Tube Div. of Calumet and Hecla Consolidated Copper Co., Detroit, Mich.

PIPE, CAST IRON, PRESSURE, BELL AND SPIGOT

Alabama Pipe Co., Anniston, Ala.
American Cast Iron Pipe Co., Birmingham, Ala.
Central Foundry Co., New York, N. Y.
Clow & Sons, James B., Chicago, Ill.
Duriron Co., Inc., Dayton, O. (Acid resisting)
Inner-Tite Clamp Corp., Elizabeth, N. J.
Lynchburg Foundry Co., Lynchburg, Va.
McWane Cast Iron Pipe Co., Birmingham, Ala.
U. S. Pipe & Fdry. Co., Burlington, N. J.
Warren Foundry & Pipe Corp., New York, N. Y.

PIPE, CAST IRON, PRESSURE, FLANGED

Alabama Pipe Co., Anniston, Ala.
American Cast Iron Pipe Co., Birmingham, Ala.
Central Foundry Co., New York, N. Y.
Clow & Sons, James B., Chicago, Ill.
Duriron Co., Inc., Dayton, O. (Acid resisting)
Inner-Tite Clamp Corp., Elizabeth, N. J.
Lynchburg Foundry Co., Lynchburg, Va.
McWane Cast Iron Pipe Co., Birmingham, Ala.
Straight Line Foundry & Machine Corp., Direct Separator Div., The, Syracuse, N. Y.
U. S. Pipe & Fdry. Co., Burlington, N. J.
● Walworth Co., New York, N. Y.
Warren Foundry & Pipe Corp., New York, N. Y.

PIPE, CAST IRON, THREADED

American Cast Iron Pipe Co., Birmingham, Ala.
Clow & Sons, James B., Chicago, Ill.

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McWane Cast Iron Pipe Co., Birmingham, Ala.
Somerville Iron Wks., Somerville, N. J.
U. S. Pipe & Fdry. Co., Burlington, N. J.
● Walworth Co., New York, N. Y.
Warren Foundry & Pipe Corp., New York, N. Y.

PIPE CLEANING COMPOUNDS

See Compounds, Cleaning, Pipe Coil and Condenser

PIPE COILS

See Coils, Pipe

PIPE COUPLINGS

See Couplings, Pipe

PIPE CUTTERS

See Cutters

PIPE CUTTING MACHINES

See Machines, Pipe Cutting and Threading

PIPE EXTRACTORS

See Extractors, Pipe

PIPE, FIBER

Fibre Conduit Co., Orangeburg, N. Y.

PIPE FITTINGS

See Fittings, Pipe

PIPE FLANGES

See Flanges, Pipe

PIPE, GLASS

Corning Glass Wks., Corning, N. Y.
Fischer & Porter Co., Hatboro, Pa.

PIPE HANGERS

See Hangers and Supports, Pipe

PIPE, HARD RUBBER

American Hard Rubber Co., New York, N. Y.
Goodrich Co., B. F., Akron, O.
Luzerne Rubber Co., Trenton, N. J. (Hard rubber)
Manhattan Rubber Mfg. Div. of Raybestos-Manhattan, Inc., Passaic, N. J.
Stokes Rubber Co., Jos., Trenton, N. J.
United States Rubber Co., New York, N. Y.

PIPE INSULATION

See Insulation, Pipe

PIPE, JACKETED

Devine Mfg. Co., Inc., J. P., Mt. Vernon, Ill.
Parks-Cramer Co., Fitchburg, Mass.
Roessing Mfg. Co., Pittsburgh, Pa.

PIPE JOINT COMPOUNDS

See Cement and Compounds, Pipe Joint

PIPE, LINED

Alpha Metal & Rolling Mills, Inc., Brooklyn, N. Y.
● American Brass Co., Waterbury, Conn. (Tin)
American Cast Iron Pipe Co., Birmingham, Ala. (Cement)
American Hard Rubber Co., New York, N. Y. (Rubber)
Cement Lined Pipe Co., Lynn, Mass.
Clow & Sons, James B., Chicago, Ill.
Cohoes Rolling Mill Co., Cohoes, N. Y. (Cement)
General Plate Div., Metals & Controls Corp., Attleboro, Mass. (Silver lined)
Goodrich Co., B. F., Akron, O. (Rubber-lined)
Jones & Laughlin Steel Corp., Pittsburgh, Pa. (Cement)
Lead Lined Iron Pipe Co., Wakefield, Mass. (Lead and tin lined)
Luzerne Rubber Co., Trenton, N. J. (Hard rubber)
Manhattan Rubber Mfg. Co. Div. of Raybestos-Manhattan, Inc., Passaic, N. J. (Rubber)
Michigan Pipe Co., Bay City, Mich. (Wood)
National Lead Co., New York, N. Y. (Lead)
National Tube Co., United States Steel Corp. Sub., Pittsburgh, Pa. (Cement)
Resisto Pipe & Valve Co., East Cambridge, Mass. (Lead)
United States Rubber Co., New York, N. Y. (Rubber)
United States Stoneware Co., New York, N. Y.
Vesco Corp., New York, N. Y. (Enamel)
Warren Foundry & Pipe Corp., New York, N. Y. (Cement-bituminous enamel)
● Youngstown Sheet & Tube Co., Youngstown, O.

PIPE LINE STRAINERS

See Strainers, Pipe Line

PIPE, NICKEL AND NICKEL ALLOY

General Plate Div., Metals & Controls Corp., Attleboro, Mass.
International Nickel Co., New York, N. Y.
Revere Copper and Brass Incorporated, New York, N. Y.
Warren Foundry & Pipe Corp., New York, N. Y.

PIPE NIPPLES

See Nipples, Pipe

PIPE, PLASTIC

Acadia Synthetic Products Div., Western Felt Works, Chicago, Ill.
American Hard Rubber Co., New York, N. Y.
Carter Products Corp., Cleveland, O.
Commercial Plastics Co., Chicago, Ill.
Continental Diamond Fibre Co., Newark, Del.
● Dow Chemical Co., Midland, Mich.
Extruded Plastics, Inc., Norwalk, Conn.
Hodgman Rubber Co., Framingham, Mass.
Mills Corp., Elmer E., Chicago, Ill.
North Penn Co., New York, N. Y.
United States Stoneware Co., New York, N. Y.
Werner Co., Inc., R. D., New York, N. Y.
Yardley Plastics Co., Columbus, O.

PIPE, PRE-INSULATED

Ehret Magnesia Mfg. Co., Valley Forge, Pa.
● Ric-wiL Co., Cleveland, O.

PIPE REAMERS

See Reamers, Pipe

PIPE REPAIR CLAMPS

See Clamps, Pipe Repair

PIPE, SPIRAL, RIVETED AND WELDED

● American Rolling Mill Co., The, Middletown, O.
Naylor Pipe Co., Chicago, Ill.
Revere Copper and Brass Incorporated, New York, N. Y.
● Taylor Forge & Pipe Wks., Chicago, Ill.

PIPE, STEEL, BUTT AND LAP WELDED

Allegheny Ludlum Steel Corp., Brackenridge, Pa.
● American Rolling Mill Co., The, Middletown, O.
Bethlehem Steel Co., Bethlehem, Pa.
Buffalo Tank Corp., Dunellen, N. J.
● Byers Co., A. M., Pittsburgh, Pa.
Chicago Bridge & Iron Co., Chicago, Ill. (Specially fabricated)
Chicago Metal Mfg. Co., Chicago, Ill.
Cohoes Rolling Mill Co., Cohoes, N. Y.
Fretz-Moon Tube Co., Butler, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Laclede Steel Co., St. Louis, Mo.
National Tube Co., United States Steel Corp. Sub., Pittsburgh, Pa.
Pittsburgh Steel Co., Pittsburgh, Pa.
Pittsburgh Tube Co., Pittsburgh, Pa.
Republic Steel Corp., Cleveland, O.
Revere Copper and Brass Incorporated, New York, N. Y.
Semet-Solvay Engineering Corp., New York, N. Y. (Specially fabricated)
South Chester Tube Co., Chester, Pa.
● Spang-Chalfant, Div. of National Supply Co., Pittsburgh, Pa.
Tippett & Wood, Phillipsburg, N. J. (12 in. and larger)
Wheatland Tube Co., Philadelphia, Pa.
Wheeling Steel Corp., Wheeling, W. Va.
● Youngstown Sheet & Tube Co., Youngstown, O.

PIPE, STEEL, SEAMLESS

Allegheny Ludlum Steel Corp., Brackenridge, Pa.
Babcock & Wilcox Tube Co., The, Beaver Falls, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
National Tube Co., United States Steel Corp. Sub., Pittsburgh, Pa.
Pittsburgh Steel Co., Pittsburgh, Pa.
● Spang-Chalfant, Div. of National Supply Co., Pittsburgh, Pa.
Timken Roller Bearing Co., Steel & Tube Div., Canton, O.
● Youngstown Sheet & Tube Co., Youngstown, O.

PIPE, STEEL, STAINLESS

Allegheny Ludlum Steel Corp., Brackenridge, Pa.
Alloy Steel Products Co., Linden, N. J.
● American Rolling Mill Co., The, Middletown, O.
Babcock & Wilcox Tube Co., The, Beaver Falls, Pa.
Colonial Alloys Co., Metals Div., Philadelphia, Pa.
Globe Steel Tubes Co., Milwaukee, Wis.
National Tube Co., United States Steel Corp. Sub., Pittsburgh, Pa.
Pittsburgh Steel Co., Pittsburgh, Pa.
Republic Steel Corp., Cleveland, O.
Timken Roller Bearing Co., Steel & Tube Div., Canton, O.

PIPE, STONEWARE

General Ceramics Co., Keasbey, N. J.
Knight, Maurice A., Akron, O. (Stoneware)
United States Stoneware Co., New York, N. Y. (Stoneware)

PIPE SUPPORTS

See Hangers and Supports, Pipe

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PIPE TONGS
See Tongs, Pipe

PIPE, TUBING, FITTINGS AND VALVES, CARBON AND GRAPHITE
National Carbon Co., Carbon Products Div., Cleveland, O.

PIPE AND TUBING, LEAD AND LEAD ALLOY
Alpha Metal & Rolling Mills, Inc., Brooklyn, N. Y.
● American Smelting & Refining Co., New York, N. Y.
Belmont Smelting & Refining Wks., Inc., Brooklyn, N. Y.
Eagle-Picher Lead Co., Cincinnati, O.
Flemm Lead Co., Inc., Long Island City, N. Y.
Lissberger & Son, Inc., Marks, Long Island City, N. Y.
National Lead Co., New York, N. Y.
Northwest Lead Co., Seattle, Wash.
Rochester Lead Works, Inc., Rochester, N. Y.
Standard Rolling Mills, Inc., Brooklyn, N. Y.
United States Stoneware Co., New York, N. Y.

PIPE VISES
See Vises, Pipe

PIPE, WOOD
● American District Steam Co., North Tonawanda, N. Y.
Caldwell Co., W. E., Louisville, Ky.
Michigan Pipe Co., Bay City, Mich.
Wyckoff & Son Co., A., Elmira, N. Y.

PIPE WRENCHES
See Wrenches, Pipe

PIPE, WROUGHT IRON
● Byers Co., A. M., Pittsburgh, Pa.

PISTON RINGS
See Rings, Piston

PITOT TUBES
See Tubes, Pitot

PITTSBURGH LOCK FORMING MACHINES
See Machines, Pittsburgh Lock Forming

PLASTIC PIPE AND PIPE FITTINGS
See Pipe, Plastic; Fittings, Pipe, Plastic

PLASTIC TUBING
See Tubing, Plastic

PLATES, FLOOR AND CEILING
American Radiator & Standard Sanitary Corp., Pittsburgh, Pa.
Beaton & Cadwell Mfg. Co., New Britain, Conn.
Beaton & Corbin Mfg. Co., Southington, Conn.
Chase Brass & Copper Co., Waterbury, Conn.
Chicago Nipple Mfg. Co., Chicago, Ill.
Farley Sleeve & Hanger Co., Cleveland, O.
Fee & Mason Mfg. Co., Inc., New York, N. Y.
● Flori Pipe Co., The, St. Louis, Mo.
Globe Machine & Stamping Co., Cleveland, O.
Grabler Mfg. Co., Cleveland, O.
● Grinnell Co., Inc., Providence, R. I.
Jarecki Mfg. Co., Erie, Pa.
Keeney Mfg. Co., Newington, Conn.
Little Mfg. Co., M. S., Hartford, Conn.
Newman Brothers, Inc., Cincinnati, O.
Ravena Iron Co., Ravena, N. Y.
Russell Mfg. Co., John M., Naugatuck, Conn.
● Walworth Co., New York, N. Y.

PLUG COCKS
See Valves, Plug

PLUG VALVES
See Valves, Plug

PORTS, OBSERVATION, BOILER
Chicago Fire Brick Co., Chicago, Ill.
Detroit Stoker Co., Detroit, Mich.
National Airoil Burner Co., Inc., Philadelphia, Pa.
Preferred Utilities Co., Inc., New York, N. Y.

POSITIONERS, WELDING
See Welding and Cutting Apparatus, Oxy-Acetylene

POWER SHEARS
See Shears, Power

PREHEATERS, FUEL OIL
● American District Steam Co., North Tonawanda, N. Y.
American Locomotive Co., Alco Products Div., New York, N. Y.
Barlow Engineering Co., New York, N. Y.
● Bell & Gossett Co., Morton Grove, Ill.
Davis Engineering Corp., Elizabeth, N. J.
Devine Mfg. Co., Inc., J. P., Mt. Vernon, Ill.
Downingtown Iron Works, Downingtown, Pa.
Engineer Co., New York, N. Y.
Frank Heaters, Inc., Paterson, N. J.
General Fittings Co., Providence, R. I.
Griscom-Russell Co., New York, N. Y.
Heat Transfer Products, Inc., New York, N. Y.
Hynes Electric Heating Co., Camden, N. J.
Johnson Corp., Three Rivers, Mich.
Leyman Mfg. Corp., John H. McGowan Co. Div., Cincinnati
National Airoil Burner Co., Inc., Philadelphia, Pa.
National Pipe Bending Co., New Haven, Conn.
● Patterson-Kelley Co., Inc., East Stroudsburg, Pa.
Preferred Utilities Co., Inc., New York, N. Y.
Richmond Engineering Co., Inc., Richmond, Va.
Ross Heater & Mfg. Co., Inc., Buffalo, N. Y.
Semet-Solvay Engineering Corp., New York, N. Y.
Sims Co., Erie, Pa.
Standard Heater & Oil Equipment Co., Jersey City, N. J.
Staples & Pfeiffer, Ltd., San Francisco, Calif.
Struthers Wells Corp., Titusville, Pa.
Taco Heaters, Inc., New York, N. Y.
● Thrush & Co., H. A., Peru, Ind.
Trent Co., Harold E., Philadelphia, Pa.
Vulcan Electric Co., Danvers, Mass.
Warren Electric Appliance Co., Warren, Pa.
● Whitlock Mfg. Co., Hartford, Conn.
● Wiegand Co., Edwin L., Pittsburgh, Pa.
Zallea Brothers & Johnson, Wilmington, Del.

PREHEATERS AND STRESS RELIEVERS, ELECTRIC, FOR PIPE WELDS
● Electric Arc, Inc., Newark, N. J.
Kuhlman Electric Co., Detroit Electric Furnace Div., Bay City Mich.
Swoboda, Inc., H. O., New Brighton, Pa.
Trent Co., Harold E., Philadelphia, Pa.

PRE-INSULATED PIPE
See Pipe, Pre-Insulated

PRESSURE BLOWERS
See Blowers, High Pressure

PRESSURE CONTROLLERS
See Regulators, Pressure

PRESSURE GAGES
See Gages, Indicating, Pressure

PRESSURE INDICATOR-CONTROLLERS
See Indicator-Controllers, Pressure

PRESSURE RECORDER-CONTROLLERS
See Recorder-Controllers, Pressure

PRESSURE RECORDERS
See Recorders, Pressure and Vacuum

PRESSURE REDUCING VALVES
See Valves, Pressure Reducing and Regulating

PRESSURE REGULATING VALVES
See Valves, Pressure Reducing and Regulating

PRESSURE REGULATORS
See Regulators, Pressure

PRESSURE SWITCHES
See Switches, Pressure and Vacuum

PROCESS HEATING SYSTEMS
See Systems, Process Heating, High Temperature

PROCESS STEAM SUPERHEATERS
See Superheaters, Process Steam

PROCESS AND STORAGE TANKS
See Tanks, Process and Storage

PROPELLER FANS
See Fans, Propeller

PROPORTIONING PUMPS
See Pumps, Proportioning

PROTECTIVE COATINGS
See Coatings, Protective, for Metal

PROTECTORS, PIPE COVERING
● American District Steam Co., North Tonawanda, N. Y.
Carpenter & Paterson, Inc., East Boston, Mass.
Cheney Metal Products Co., Trenton, N. J.
● Grant Wilson, Inc., Chicago, Ill.

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● Grinnell Co., Inc., Providence, R. I.
● Ric-wiL Co., Cleveland, O.
● Wilson, Inc., Grant, Chicago, Ill.

PSYCHROMETERS, SLING AND HAND ASPIRATED

American Moistening Co., Providence, R. I.
Friez Instrument Div., Bendix Aviation Corp., Towson, Md.
G. M. Mfg. Co., New York, N. Y.
H-B Instrument Co., Philadelphia, Pa.
Hill, E. Vernon, Chicago, Ill.
● Johnson Service Co., Milwaukee, Wis.
● Leeds & Northrup Co., Philadelphia, Pa.
Moeller Instrument Co., Richmond Hill, N. Y.
Palmer Co., Cincinnati (Norwood), O.
Parks-Cramer Co., Fitchburg, Mass.
Precision Thermometer & Instrument Co., Philadelphia, Pa.
Scientific Instrument Co., Detroit, Mich.
Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
Taylor Instrument Companies, Rochester, N. Y.
Trerice Co., H. O., Detroit, Mich.
Weksler Thermometer Corp., New York, N. Y.

PSYCHROSTATS

See Humidistats

PULLEYS AND SHEAVES, FOR BELT DRIVES

● Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American Pulley Co., Philadelphia, Pa.
Browning Mfg. Co., Inc., Maysville, Ky.
Congress Die Casting Div., Congress Tool & Die Co., Detroit, Mich.
Dayton Rubber Mfg. Co., Dayton, O.
Dick Co., Inc., R. & J., Passaic, N. J. (Steel split)
Gates Rubber Co., The, Denver, Colo.
Goldens' Foundry & Machine Co., Columbus, Ga. (Cast iron)
Ideal Commutator Dresser Co., Sycamore, Ill.
Lau Blower Co., Dayton, O.
Lewellen Mfg. Co., Columbus, Ind.
Mayne Products Co., Dayton, O. (Variable speed)
Morrison Products, Inc., Cleveland, O.
Pyott Foundry & Machine Co., Chicago, Ill.
Rockwood Mfg. Co., Indianapolis, Ind.
Smith, Inc., Winfield H., Springville, N. Y.
Speedmaster Co., The, Des Plaines, Ill.
Swift Mfg. Co., Detroit, Mich. (Cast iron)
Thermoid Rubber, Div. of Thermoid Co., Trenton, N. J.
Utility Fan Corp., Los Angeles, Calif.
Wood's Sons Co., T. B., Chambersburg, Pa.
● Worthington Pump & Machinery Corp., Harrison, N. J.

PUMP BASES

See Bases and Pads, Vibration Isolating

PUMP VALVES

See Valves, Pump

PUMPS, BOILER FEED

Acker Organization, Inc., W. M., Cleveland, O.
Aldrich Pump Co., Allentown, Pa.
● Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American-Marsh Pumps, Inc., Battle Creek, Mich.
Aurora Pump Co., Aurora, Ill.
Austin-Mason Co., New York, N. Y.
● Buffalo Pumps, Inc., Buffalo, N. Y.
Byron Jackson Co., Los Angeles, Calif.
Chicago Pump Co., Chicago, Ill.
Cissell Mfg. Co., W. M., Louisville, Ky.
Columbus Steam Pump Wks. Co., Columbus, O.
Davidson Co., M. T., Brooklyn, N. Y.
Dayton-Dowd Co., Quincy, Ill.
● Dean Brothers Pumps, Inc., Indianapolis, Ind.
Dean Hill Pump Co., Indianapolis, Ind.
Decatur Pump Co., Decatur, Ill.
Deming Co., Salem, O.
Domestic Engine & Pump Co., Shippensburg, Pa.
● Eagan Co., Walter H., Philadelphia, Pa.
Eclipse Fuel Engineering Co., Rockford, Ill.
Economy Pumps, Inc., Hamilton, O.
Fairbanks, Morse & Co., Chicago, Ill.
Foster Pump Works, Inc., Brooklyn, N. Y.
Frederick Iron & Steel Co., Frederick, Md.
Gardner-Denver Co., Quincy, Ill.
Goulds Pumps, Inc., Seneca Falls, N. Y.
Guild & Garrison, Inc,. Brooklyn, N. Y.
● Ingersoll-Rand, New York, N. Y.
Jackson Co., Byron, Los Angeles, Calif.
Johnson Corp., Three Rivers, Mich.
Kingsford Foundry & Machine Wks., Oswego, N. Y.
Kisco Boiler & Engineering Co., St. Louis, Mo.
Lawrence Pump & Engine Co., Lawrence, Mass.
Lecourtenay Co., Newark, N. J.
Leyman Mfg. Corp., John H. McGowan Co. Div., Cincinnati, O.
Mears-Kane-Ofeldt, Inc., Philadelphia, Pa.
Morehead Mfg. Co., Detroit, Mich.
Morris Machine Works, Baldwinsville, N. Y.
● Nash Engineering Co., South Norwalk, Conn.
National Steam Pump Co., Upper Sandusky, O.
Oberdorfer Brass Co., M. L., Syracuse, N. Y.
Pacific Pump Works, Huntington Park, Calif.
Robbins & Myers, Inc., Springfield, O.
Schaub Engineering Co., Fred H., Chicago, Ill.
Sellers Engineering Co., Chicago, Ill.
Skidmore Corp., St. Joseph, Mich.
● Sterling, Inc., Milwaukee, Wis.
Swaby Mfg. Co., Chicago, Ill.
Union Steam Pump Co., Battle Creek, Mich.
Warren Steam Pump Co., Inc., Warren, Mass.
Weil Pump Co., Chicago, Ill.
Weinman Pump Co., Columbus, O.
Westco Div., Pomona Pump Co. Div., Joshua Hendy Iron Works, St. Louis, Mo.
● Worthington Pump & Machinery Corp., Harrison, N. J.
Yeomans Bros. Co., Chicago, Ill.

PUMPS, CENTRIFUGAL

Air-O-Line Co., The, Dallas, Tex.
Aldrich Pump Co., Allentown, Pa.
● Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American-Marsh Pumps, Inc., Battle Creek, Mich.
American Well Wks., Aurora, Ill.
Ames Hydrovac Corp., Brooklyn, N. Y.
Aurora Pump Co., Aurora, Ill.
Austin-Mason Co., New York, N. Y.
Barrett, Haentjens & Co., Hazleton, Pa.
Beach-Russ Co., New York, N. Y.
● Bell & Gossett Co., Morton Grove, Ill.
Blaisdell Compressor Co., New York, N. Y.
● Buffalo Pumps, Inc., Buffalo, N. Y.
Byron Jackson Co., Los Angeles, Calif.
Chain Belt Co., Milwaukee, Wis.
Chicago Pump Co., Chicago, Ill.
Columbus Steam Pump Wks. Co., Columbus, O.
Davidson Co., M. T., Brooklyn, N. Y.
Dayton-Dowd Co., Quincy, Ill.
● Dean Brothers Pumps, Inc., Indianapolis, Ind.
Dean Hill Pump Co., Indianapolis, Ind.
Decatur Pump Co., Decatur, Ill.
De Laval Steam Turbine Co., Trenton, N. J.
Deming Co., Salem, O.
Domestic Engine & Pump Co., Shippensburg, Pa.
● Dunham Co., C. A., Chicago, Ill.
Duriron Co., Inc., Dayton, O. (Acid resisting)
● Eagan Co., Walter H., Philadelphia, Pa.
Eastern Engineering Co., New Haven, Conn.
Economy Pumps, Inc., Hamilton, O.
Fairbanks, Morse & Co., Chicago, Ill.
Foster Pump Works, Inc., Brooklyn, N. Y.
Frederick Iron & Steel Co., Frederick, Md.
Fulflo Specialties Co., Inc., The, Blanchester, O.
Gardner-Denver Co., Quincy, Ill.
Goulds Pumps, Inc., Seneca Falls, N. Y.
Guild & Garrison, Inc., Brooklyn, N. Y.
● Ingersoll-Rand, New York, N. Y.
Jackson Co., Byron, Los Angeles, Calif.
Kimball-Krogh Pump Div., Food Machinery Corp., Los Angeles, Calif.
Kingsford Foundry & Machine Wks., Oswego, N. Y.
La Bour Co., Inc., The, Elkhart, Ind.
Lawrence Pump & Engine Co., Lawrence, Mass.
Lecourtenay Co., Newark, N. J.
Lewis & Co., Inc., Chas. S., St. Louis, Mo.
Leyman Mfg. Corp., John H. McGowan Co. Div., Cincinnati, O
Luzerne Rubber Co., Trenton, N. J. (Hard hubber)
Morris Machine Works, Baldwinsville, N. Y.
● Nash Engineering Co., South Norwalk, Conn.
National Carbon Co., Carbon Products Div., Cleveland, O.
Oberdorfer Brass Co., M. L., Syracuse, N. Y.
Pacific Pump Works, Huntington Park, Calif.
Palmer Electric Co., Detroit, Mich.
Pennsylvania Pump & Compressor Co., Easton, Pa.
Quimby Pump Div., H. K. Porter Co., Inc., Newark, N. J.
Red Jacket Mfg. Co., Davenport, Ia.
Schneible Co., Claude B., Detroit, Mich.
Schwitzer-Cummins Co., Indianapolis, Ind.
Skidmore Corp., St. Joseph, Mich.
Swaby Mfg. Co., Chicago, Ill.
Taber Pump Co., Buffalo, N. Y.
● Trane Co., The, La Crosse, Wis.
Union Steam Pump Co., Battle Creek, Mich.
Utility Fan Corp., Los Angeles, Calif.
Warren Steam Pump Co., Inc., Warren, Mass.
Weil Pump Co., Chicago, Ill.
Weinman Pump Mfg. Co., Columbus, O.
Westco Div., Pomona Pump Co. Div., Joshua Hendy Iron Works, St. Louis, Mo.
Whittington Pump & Engineering Co., Indianapolis, Ind.
● Worthington Pump & Machinery Corp., Harrison, N. J.
Yeomans Bros. Co., Chicago, Ill.

PUMPS, CONDENSATION RETURN

Aldrich Pump Co., Allentown, Pa.
● Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American-Marsh Pumps, Inc., Battle Creek, Mich.
Ames Hydrovac Corp., Brooklyn, N. Y.
Aurora Pump Co., Aurora, Ill.
● Buffalo Pumps, Inc., Buffalo, N. Y.
Byron Jackson Co., Los Angeles, Calif.
Chicago Pump Co., Chicago, Ill.
Cissell Mfg. Co., W. M., Louisville, Ky.

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Cochrane Corp., Philadelphia, Pa.
Columbus Steam Pump Wks. Co., Columbus, O.
Davidson Co., M. T., Brooklyn, N. Y.
Dayton-Dowd Co., Quincy, Ill.
• Dean Brothers Pumps, Inc., Indianapolis, Ind.
Dean Hill Pump Co., Indianapolis, Ind.
Decatur Pump Co., Decatur, Ill.
De Laval Steam Turbine Co., Trenton, N. J.
Deming Co., Salem, O.
Domestic Engine & Pump Co., Shippensburg, Pa.
• Dunham Co., C. A., Chicago, Ill.
• Eagan Co., Walter H., Philadelphia, Pa.
Eastern Engineering Co., New Haven, Conn.
Eclipse Fuel Engineering Co., Rockford, Ill.
Economy Pumps, Inc., Hamilton, O.
Fairbanks, Morse & Co., Chicago, Ill.
Foster Pump Works, Inc., Brooklyn, N. Y.
Frederick Iron & Steel Co., Frederick, Md.
Goulds Pumps, Inc., Seneca Falls, N. Y.
Guild & Garrison, Inc., Brooklyn, N. Y.
Heating Assurance, Inc., Spokane, Wash.
• Hoffman Specialty Co., Indianapolis, Ind.
• Ingersoll-Rand, New York, N. Y.
Jackson Co., Byron, Los Angeles, Calif.
Johnson Corp., Three Rivers, Mich.
Kisco Boiler & Engineering Co., St. Louis, Mo.
Lawrence Pump & Engine Co., Lawrence, Mass.
Lecourtenay Co., Newark, N. J.
Lewis & Co., Inc., Chas. S., St. Louis, Mo.
Leyman Mfg. Corp., John H. McGowan Co. Div., Cincinnati, O.
Mears-Kane-Ofeldt, Inc., Philadelphia, Pa.
Morehead Mfg. Co., Detroit, Mich.
• Nash Engineering Co., South Norwalk, Conn.
National Steam Pump Co., Upper Sandusky, O.
Oberdorfer Brass Co., M. L., Syracuse, N. Y.
O'Brien Steam Specialty Co., Syracuse, N. Y.
Pacific Pump Works, Huntington Park, Calif.
Quimby Pump Div., H. K. Porter Co., Inc., Newark, N. J.
Schaub Engineering Co., Fred H., Chicago, Ill.
Sellers Engineering Co., Chicago, Ill.
Skidmore Corp., St. Joseph, Mo.
• Sterling, Inc., Milwaukee, Wis.
Swaby Mfg. Co., Chicago, Ill.
• Trane Co., The, La Crosse, Wis.
Union Steam Pump Co., Battle Creek, Mich.
Warren Steam Pump Co., Inc., Warren, Mass.
Weil Pump Co., Chicago, Ill.
Weinman Pump Co., Columbus, O.
Westco Div., Pomona Pump Co. Div., Joshua Hendy Iron Works, St. Louis, Mo.
Whittington Pump & Engineering Co., Indianapolis, Ind.
• Worthington Pump & Machinery Corp., Harrison, N. J.
Yeomans Bros. Co., Chicago, Ill.

PUMPS, DEEP WELL, TURBINE

American-Marsh Pumps, Inc., Battle Creek, Mich.
American Well Wks., Aurora, Ill.
Aurora Pump Co., Aurora, Ill.
Byron Jackson Co., Los Angeles, Calif.
Cook, Inc., A. D., Lawrenceburg, Ind.
Davidson Co., M. T., Brooklyn, N. Y.
Deming Co., Salem, O.
Fairbanks, Morse & Co., Chicago, Ill.
Guild & Garrison, Inc., Brooklyn, N. Y.
Jackson Co., Byron, Los Angeles, Calif.
Kimball-Krogh Pump Div., Food Machinery Corp., Los Angeles, Calif.
Layne & Bowler, Inc., Memphis, Tenn.
Leyman Mfg. Corp., John H. McGowan Co. Div., Cincinnati, O.
Pacific Pump Works, Huntington Park, Calif.
• Peerless Pump Div., Food Machinery Corp., Canton, O.
Pomona Pump Co. Div., Joshua Hendy Iron Works, Pomona, Calif.
Red Jacket Mfg. Co., Davenport, Ia.
Uniflow Mfg. Co., Erie, Pa.
• Worthington Pump & Machinery Corp., Harrison, N. J.

PUMPS, FIRE

• Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American-Marsh Pumps, Inc., Battle Creek, Mich.
Aurora Pump Co., Aurora, Ill.
Blackmer Pump Co., Grand Rapids, Mich.
• Buffalo Pumps, Inc., Buffalo, N. Y.
Byron Jackson Co., Los Angeles, Calif.
Chicago Pump Co., Chicago, Ill.
Dayton-Dowd Co., Quincy, Ill.
De Laval Steam Turbine Co., Trenton, N. J.
Economy Pumps, Inc., Hamilton, O.
Fairbanks, Morse & Co., Chicago, Ill.
Goulds Pumps, Inc., Seneca Falls, N. Y.
Guild & Garrison, Inc., Brooklyn, N. Y.
Jackson Co., Byron, Los Angeles, Calif.
Lecourtenay Co., Newark, N. J.
Leyman Mfg. Corp., John H. McGowan Co. Div., Cincinnati, O.
Morris Machine Wks., Baldwinsville, N. Y.
Oberdorfer Brass Co., M. L., Syracuse, N. Y.
Pennsylvania Pump & Compressor Co., Easton, Pa.
Pomona Pump Co. Div., Joshua Hendy Iron Works, Pomona, Calif.
Viking Pump Co., Cedar Falls, Ia.
Warren Steam Pump Co., Inc., Warren, Mass.
• Worthington Pump & Machinery Corp., Harrison, N. J.

PUMPS, LIQUID REFRIGERANT CIRCULATING

Aurora Pump Co., Aurora, Ill.
Byron Jackson Co., Los Angeles, Calif.
Chicago Pump Co., Chicago, Ill.
• Eagan Co., Walter H., Philadelphia, Pa.
Economy Pumps, Inc., Hamilton, O.
Goulds Pumps, Inc., Seneca Falls, N. Y.
Guild & Garrison, Inc., Brooklyn, N. Y.
• Ingersoll-Rand, New York, N. Y.
Jackson Co., Byron, Los Angeles, Calif.
Lewis & Co., Chas. S., St. Louis, Mo.
Red Jacket Mfg. Co., Davenport, Ia.
Roper Corp., Geo. D., Rockford, Ill.
Vilter Mfg. Co., Milwaukee, Wis.
Warren Steam Pump Co., Inc., Warren, Mass.
Westco Div., Pomona Pump Co. Div., Joshua Hendy Iron Works St. Louis, Mo.
• Worthington Pump & Machinery Corp., Harrison, N. J.

PUMPS, PROPORTIONING

Cochrane Corp., Philadelphia, Pa.
Dearborn Chemical Co., Chicago, Ill.
Eastern Engineering Co., New Haven, Conn.
Haering Co., Inc., D. W., Chicago, Ill.
Jabsco Pump Co., Beverly Hills, Calif.
Nelson Chemical Pumps, Casper, Wyo.
% Proportioneers, Inc. %, Providence, R. I.
Roy Pumps, Milton, Philadelphia, Pa.
Wallace & Tiernan Co., Inc., Newark, N. J.

PUMPS, RECIPROCATING

Aldrich Pump Co., Allentown, Pa.
Alten's Foundry & Machine Works, Lancaster, O.
American-Marsh Pumps, Inc., Battle Creek, Mich.
Austin-Mason Co., New York, N. Y.
• Buffalo Pumps, Inc., Buffalo, N. Y.
Columbus Steam Pump Wks., Columbus, O.
Davidson Co., M. T., Brooklyn, N. Y.
• Dean Brothers Pumps, Inc., Indianapolis, Ind.
Deming Co., Salem, O.
Devine Mfg. Co., Inc., J. P., Mt. Vernon, Ill.
Duro Co., Dayton, O.
• Eagan Co., Walter H., Philadelphia, Pa.
Everite Pump & Mfg. Co., Inc., Lancaster, Pa.
Fairbanks, Morse & Co., Chicago, Ill.
Foster Pumps Wks., Inc., Brooklyn, N. Y.
Gardner-Denver Co., Quincy, Ill.
Goulds Pumps, Inc., Seneca Falls, N. Y.
Guild & Garrison, Inc., Brooklyn, N. Y.
Homestead Valve Mfg. Co., Coraopolis, Pa.
• Ingersoll-Rand, New York, N. Y.
Leyman Mfg. Corp., John H. McGowan Co. Div., Cincinnati, O.
Myers & Bro. Co., F. E., The, Ashland, O.
National Steam Pump Co., Upper Sandusky, O.
Red Jacket Mfg. Co., Davenport, Ia.
Roy Pumps, Milton, Philadelphia, Pa.
Uniflow Mfg. Co., Erie, Pa.
Union Steam Pump Co., Battle Creek, Mich.
Warren Steam Pump Co., Inc., Warren, Mass.
Watson-Stillman Co., Roselle, N. J.
• Worthington Pump & Machinery Corp., Harrison, N. J.

PUMPS, ROTARY

Allen Billmyre Co., Mamaroneck, N. Y.
American Hard Rubber Co., New York, N. Y. (Hard rubber)
Beach-Russ Co., New York, N. Y.
Blackmer Pump Co., Grand Rapids, Mich.
Bowser, Inc., Fort Wayne, Ind.
De Laval Steam Turbine Co., Trenton, N. J.
Deming Co., Salem, O.
• Eagan Co., Walter H., Philadelphia, Pa.
Eastern Engineering Co., New Haven, Conn.
Fairbanks, Morse & Co., Chicago, Ill.
Foster Pump Wks., Inc., Brooklyn, N. Y.
Goulds Pumps, Inc., Seneca Falls, N. Y.
• Ingersoll-Rand, New York, N. Y.
Kinney Mfg. Co., Boston, Mass.
Kraissl Co., Inc., The, Hackensack, N. J.
Lammert & Mann Co., Chicago, Ill.
Leyman Mfg. Corp., John H. McGowan Co. Div., Cincinnati, O.
• Martocello & Co., Jos. A., Philadelphia, Pa.
• May Oil Burner Corp., Baltimore, Md.
Monarch Mfg. Wks., Inc., Philadelphia, Pa.
• Nash Engineering Co., South Norwalk, Conn.
Oberdorfer Brass Co., M. L., Syracuse, N. Y.
• Peerless Pump Div., Food Machinery Corp., Canton, O.
Quimby Pump Div., H. K. Porter Co., Inc., Newark, N. J.
Red Jacket Mfg. Co., Davenport, Ia.
Robbins & Myers, Inc., Springfield, O.
Roots-Connersville Blower Corp., Connersville, Ind.
Roper Corp., Geo. D., Rockford, Ill.
Schutte & Koerting Co., Philadelphia, Pa.
Scott-Newcomb, Inc., St. Louis, Mo.
Sundstrand Machine Tool Co., Pump Div., Rockford, Ill.
Taber Pump Co., Buffalo, N. Y.

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Trimount Rotary Power Co., East Dedham, Mass.
Tuthill Pump Co., Chicago, Ill.
Viking Pump Co., Cedar Falls, Ia.
● Worthington Pump & Machinery Corp., Harrison, N. J.
Yale & Towne Mfg. Co., Stamford, Conn.

PUMPS, SEWAGE AND SLUDGE

American Well Works, Aurora, Ill.
Aurora Pump Co., Aurora, Ill.
Byron Jackson Co., Los Angeles, Calif.
Chicago Pump Co., Chicago, Ill.
Deming Co., Salem, O.
Domestic Engine & Pump Co., Shippensburg, Pa.
● Eagan Co., Walter H., Philadelphia, Pa.
Guild & Garrison, Inc., Brooklyn, N. Y.
● Ingersoll-Rand, New York, N. Y.
Jackson Co., Byron, Los Angeles, Calif.
Kimball-Krogh Pump Div., Food Machinery Corp., Los Angeles, Calif.
Kingsford Foundry & Machine Works, Oswego, N. Y.
● Nash Engineering Co., South Norwalk, Conn.
Quimby Pump Div., H. K. Porter Co., Inc., Newark, N. J.
Swaby Mfg. Co., Chicago, Ill.
Weil Pump Co., Chicago, Ill.
Weinman Pump Co., Columbus, O.
● Worthington Pump & Machinery Corp., Harrison, N. J.
Yeomans Bros. Co., Chicago, Ill.

PUMPS, STEAM

American-Marsh Pumps, Inc., Battle Creek, Mich.
Austin-Mason Co., New York, N. Y.
● Buffalo Pumps, Inc., Buffalo, N. Y.
Columbus Steam Pump Wks. Co., Columbus, O.
Davidson Co., M. T., Brooklyn, N. Y.
● Dean Brothers Pumps, Inc., Indianapolis, Ind.
● Eagan Co., Walter H., Philadelphia, Pa.
Fairbanks, Morse & Co., Chicago, Ill.
Foster Pump Wks., Inc., Brooklyn, N. Y.
Gardner-Denver Co., Quincy, Ill.
Guild & Garrison, Inc., Brooklyn, N. Y.
● Ingersoll-Rand, New York, N. Y.
Leyman Mfg. Corp., John H. McGowan Co. Div., Cincinnati, O.
National Steam Pump Co., Upper Sandusky, O.
Union Steam Pump Co., Battle Creek, Mich.
Warren Steam Pump Co., Inc., Warren, Mass.
Watson-Stillman Co., Roselle, N. J.
● Worthington Pump & Machinery Corp., Harrison, N. J.

PUMPS, SUMP

● Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American-Marsh Pumps, Inc., Battle Creek, Mich.
Aurora Pump Co., Aurora, Ill.
Austin-Mason Co., New York, N. Y.
● Buffalo Pumps, Inc., Buffalo, N. Y.
Byron Jackson Co., Los Angeles, Calif.
Chicago Pneumatic Tool Co., New York, N. Y.
Chicago Pump Co., Chicago, Ill.
Columbus Steam Pump Wks. Co., Columbus, O.
Davidson Co., M. T., Brooklyn, N. Y.
Dayton-Dowd Co., Quincy, Ill.
Dean Hill Pump Co., Indianapolis, Ind.
De Laval Steam Turbine Co., Trenton, N. J.
Deming Co., Salem, O.
Domestic Engine & Pump Co., Shippensburg, Pa.
Duro Co., Dayton, O.
● Eagan Co., Walter H., Philadelphia, Pa.
Eastern Engineering Co., New Haven, Conn.
Economy Pumps, Inc., Hamilton, O.
Everite Pump & Mfg. Co., Inc., Lancaster, Pa.
Fairbanks, Morse & Co., Chicago, Ill.
Foster Pump Wks., Inc., Brooklyn, N. Y.
Frederick Iron & Steel Co., Frederick, Md.
Goulds Pumps, Inc., Seneca Falls, N. Y.
Guild & Garrison, Inc., Brooklyn, N. Y.
Imperial Brass Mfg. Co., Chicago, Ill.
Independent Pneumatic Tool Co., Chicago, Ill.
● Ingersoll-Rand, New York, N. Y.
Jabsco Pump Co., Beverly Hills, Calif.
Jackson Co., Byron, Los Angeles, Calif.
Kimball-Krogh Pump Div., Food Machinery Corp., Los Angeles, Calif.
Kingsford Foundry & Machine Wks., Oswego, N. Y.
Lawrence Pump & Engine Co., Lawrence, Mass.
Leyman Mfg. Corp., John H. McGowan Co. Div., Cincinnati, O.
Morris Machine Wks., Baldwinsville, N. Y.
● Nash Engineering Co., South Norwalk, Conn.
Noera Mfg. Co., Div. Chase Brass & Copper Co., Waterbury, Conn.
Oberdorfer Brass Co., M. L., Syracuse, N. Y.
● Peerless Pump Div., Food Machinery Corp., Canton, O.
Penberthy Injector Co., Detroit, Mich.
Pomona Pump Co. Div., Joshua Hendy Iron Works, Pomona, Calif.
Quimby Pump Div., H. K. Porter Co., Inc., Newark, N. J.
Red Jacket Mfg. Co., Davenport, Ia.
Schneible Co., Claude B., Detroit, Mich.
Schutte & Koerting Co., Philadelphia, Pa.
Swaby Mfg. Co., Chicago, Ill.
Taber Pump Co., Buffalo, N. Y.
Triplex Heating Specialty Co., Peru, Ind.
Uniflow Mfg. Co., Erie, Pa.
Union Steam Pump Co., Battle Creek, Mich.
Weil Pump Co., Chicago, Ill.
Weinman Pump Co., Columbus, O.
● Worthington Pump & Machinery Corp., Harrison, N. J.
Yeomans Bros. Co., Chicago, Ill.

PUMPS, VACUUM

Allen Billmyre Co., Mamaroneck, N. Y.
● Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American Automatic Typewriter Co., Chicago, Ill.
American-Marsh Pumps, Inc., Battle Creek, Mich.
Beach-Russ Co., New York, N. Y.
Bury Compressor Co., Erie, Pa.
Chicago Pneumatic Tool Co., New York, N. Y.
Chicago Pump Co., Chicago, Ill.
Croll-Reynolds Engineering Co., Inc., New York, N. Y.
Davidson Co., M. T., Brooklyn, N. Y.
● Dean Brothers Pumps, Inc., Indianapolis, Ind.
Devine Mfg. Co., Inc., J. P., Mt. Vernon, Ill.
● Dunham Co., C. A., Chicago, Ill.
Economy Pumps, Inc., Hamilton, O.
Eisler Engineering Corp., Newark, N. J.
Elliott Co., Jeannette, Pa.
Foster Pump Wks., Inc., Brooklyn, N. Y.
Foster Wheeler Corp., New York, N. Y.
Fuller Co., Catasauqua, Pa.
Gardner-Denver Co., Quincy, Ill.
Guild & Garrison, Inc., Brooklyn, N. Y.
● Ingersoll-Rand, New York, N. Y.
Kinney Mfg. Co., Boston, Mass.
Kraissl Co., Inc., The, Hackensack, N. J.
Lammert & Mann Co., Chicago, Ill.
Leyman Mfg. Corp., John H. McGowan Co. Div., Cincinnati, O
● Nash Engineering Co., South Norwalk, Conn.
National Steam Pump Co., Upper Sandusky, O.
Pennsylvania Pump & Compressor Co., Easton, Pa.
Roots-Connersville Blower Corp., Connersville, Ind.
Roper Corp., Geo. D., Rockford, Ill.
Ross Heater & Mfg. Co., Inc., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Skidmore Corp., St. Joseph, Mich.
Trimount Rotary Power Co., East Dedham, Mass.
Union Steam Pump Co., Battle Creek, Mich.
Viking Pump Co., Cedar Falls, Ia.
Wheeler Mfg. Co., C. H., Philadelphia, Pa.
Whittington Pump & Engineering Co., Indianapolis, Ind.
● Worthington Pump & Machinery Corp., Harrison, N. J.
Yeomans Bros. Co., Chicago, Ill.

PUMPS, VACUUM HEATING

American-Marsh Pumps, Inc., Battle Creek, Mich.
Ames Hydrovac Corp., Brooklyn, N. Y.
Beach-Russ Co., New York, N. Y.
Chicago Pump Co., Chicago, Ill.
Columbus Steam Pump Wks. Co., Columbus, O.
Croll-Reynolds Engineering Co., Inc., New York, N. Y.
Domestic Engine & Pump Co., Shippensburg, Pa.
● Dunham Co., C. A., Chicago, Ill.
● Eagan Co., Walter H., Philadelphia, Pa.
Economy Pumps, Inc., Hamilton, O.
Gardner-Denver Co., Quincy, Ill.
Guild & Garrison, Inc., Brooklyn, N. Y.
Gylstrom Co., O., Milwaukee, Wis.
● Hoffman Specialty Co., Indianapolis, Ind.
Leyman Mfg. Corp., John H. McGowan Co. Div., Cincinnati, O
● Nash Engineering Co., South Norwalk, Conn.
Roots-Connersville Blower Corp., Connersville, Ind.
Skidmore Corp., St. Joseph, Mich.
● Sterling, Inc., Milwaukee, Wis.
Union Steam Pump Co., Battle Creek, Mich.
Warren Steam Pump Co., Inc., Warren, Mass.
Whittington Pump & Engineering Co., Indianapolis, Ind.
● Worthington Pump & Machinery Corp., Harrison, N. J.

PUMPS, VISCOUS LIQUIDS AND HEAVY MATERIALS

Aldrich Pump Co., Allentown, Pa.
● Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American-Marsh Pumps, Inc., Battle Creek, Mich.
Austin-Mason Co., New York, N. Y.
Beach-Russ Co., New York, N. Y.
Blackmer Pump Co., Grand Rapids, Mich.
● Buffalo Pumps, Inc., Buffalo, N. Y.
Byron Jackson Co., Los Angeles, Calif.
Chicago Pump Co., Chicago, Ill.
Columbus Steam Pump Wks. Co., Columbus, O.
Davidson Co., M. T., Brooklyn, N. Y.
● Dean Brothers Pumps, Inc., Indianapolis, Ind.
● Eagan Co., Walter H., Philadelphia, Pa.
Economy Pumps, Inc., Hamilton, O.
Engineer Co., New York, N. Y.
Fairbanks, Morse & Co., Chicago, Ill.
Foster Pump Wks., Inc., Brooklyn, N. Y.
Frederick Iron & Steel Co., Frederick, Md.
Gardner-Denver Co., Quincy, Ill.
Goulds Pumps, Inc., Seneca Falls, N. Y.
Guild & Garrison, Inc., Brooklyn, N. Y.
● Ingersoll-Rand, New York, N. Y.

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Jabsco Pump Co., Beverly Hills, Calif.
Jackson Co., Byron, Los Angeles, Calif.
Kimball-Krogh Pump Div., Food Machinery Corp., Los Angeles, Calif.
Kingsford Foundry & Machine Wks., Oswego, N. Y.
Kinney Mfg. Co., Boston, Mass.
Kraissl Co., Inc., The, Hackensack, N. J.
Lawrence Pump & Engine Co., Lawrence, Mass.
Leyman Mfg. Corp., John H. McGowan Co. Div., Cincinnati, O.
Morris Machine Wks., Baldwinsville, N. Y.
Quimby Pump Div., H. K. Porter Co., Inc., Newark, N. J.
Red Jacket Mfg. Co., Davenport, Ia.
Robbins & Myers, Inc., Springfield, O.
Roots-Connersville Blower Corp., Connersville, Ind.
Roper Corp., Geo. D., Rockford, Ill.
Schutte & Koerting Co., Philadelphia, Pa.
Taber Pump Co., Buffalo, N. Y.
Tuthill Pump Co., Chicago, Ill.
Union Steam Pump Co., Battle Creek, Mich.
Viking Pump Co., Cedar Falls, Ia.
Warren Steam Pump Co., Inc., Warren, Mass.
● Worthington Pump & Machinery Corp., Harrison, N. J.
Yeomans Bros. Co., Chicago, Ill.

PUNCHES, SHEET METAL

Beatty Machine & Mfg. Co., Hammond, Ind.
Bertsch & Co., Inc., Cambridge City, Ind.
Bliss Co., E. W., Toledo, O.
C-B Tool Co., Lancaster, Pa.
Callahan Can Machine Co., Inc., Brooklyn, N. Y.
Champion Blower & Forge Co., Lancaster, Pa.
Cleveland Punch & Shear Wks. Co., Cleveland, O.
Excelsior Tool & Machine Co., East St. Louis, Ill.
Greenlee Tool Co., Rockford, Ill.
Heartley Machine & Tool Co., Toledo, O.
Hendley & Whittemore Co., Beloit, Wis.
Henry & Wright Mfg. Co., Hartford, Conn.
International Nutyp Tool Co., Oswego, N. Y.
Kidder Mfg. Co., Inc., J. F., Burlington, Vt.
New Albany Machine Mfg. Co., New Albany, Ind.
Niagara Machine & Tool Wks., Buffalo, N. Y.
Parker-Kalon Corp., New York, N. Y.
Peck, Stow & Wilcox Co., Southington, Conn.
Perkins Machine Co., Warren, Mass.
Rock River Machine Co., Inc., Janesville, Wis.
Royersford Foundry & Machine Co., Inc., Royersford, Pa.
Service Machine Co., Elizabeth, N. J.
Swaine Mfg. Co., Fred J., St. Louis, Mo.
Whitney Mfg. Co., W. A., Rockford, Ill.
Whitney Metal Tool Co., Rockford, Ill.
Wiedemann Machine Co., Philadelphia, Pa.
Zeh & Hahnemann Co., Newark, N. J.

PURGERS, REFRIGERANT GAS

● Armstrong Machine Works, Three Rivers, Mich.
Frick Co., Waynesboro, Pa.
Vilter Mfg. Co., Milwaukee, Wis.

RADIANT HEAT THERMOSTATS

See Thermostats, Radiant Heat

RADIATION, CONVECTION TYPE, FERROUS

American Radiator & Standard Sanitary Corp., Pittsburgh, Pa.
Beacon-Morris Corp., Boston, Mass.
● Burnham Boiler Corp., Irvington, N. Y.
● Crane Co., Chicago, Ill.
● Dunham Co., C. A., Chicago, Ill.
● Marlo Coil Co., St. Louis, Mo.
● Modine Mfg. Co., Racine, Wis.
National Radiator Co., The, Johnstown, Pa.
Pierce Butler Radiator Corp., Syracuse, N. Y.
Refrigeration Economics Co., Inc., Canton, O.
Richmond Radiator Co., Gas Products Div., Uniontown, Pa.
Shaw-Perkins Mfg. Co., Pittsburgh, Pa.
● Smith Co., Inc., The, H. B., Westfield, Mass.
● Trane Co., The, La Crosse, Wis.
United States Radiator Corp., Detroit, Mich.
Utica Radiator Corp., Utica, N. Y.
Vulcan Radiator Co., Hartford, Conn.
Weil-McLain Co., Chicago, Ill.
● Young Radiator Co., Racine, Wis.

RADIATION, CONVECTION TYPE, NON-FERROUS

American Radiator & Standard Sanitary Corp., Pittsburgh, Pa.
Beacon-Morris Corp., Boston, Mass.
● Bush Mfg. Co., Hartford, Conn.
● Dunham Co., C. A., Chicago, Ill.
● G. & O. Mfg. Co., New Haven, Conn.
Kehm Corp., The., Chicago, Ill.
McQuay, Inc., Minneapolis, Minn.
● Modine Mfg. Co., Racine, Wis.
Refrigeration Economics Co., Inc., Canton, O.
Rome-Turney Radiator Co., Rome, N. Y.
Shaw-Perkins Mfg. Co., Pittsburgh, Pa.
Super Radiator Corp., Minneapolis, Minn.
● Tilco-Fin, Inc., Brooklyn, N. Y.
● Trane Co., The, La Crosse, Wis.
● Tuttle & Bailey, Inc., New Britain, Conn.
Vapor Car Heating Co., Inc., Chicago, Ill.
Vulcan Radiator Co., Hartford, Conn.
● Young Radiator Co., Racine, Wis.

RADIATION, DIRECT

American Radiator & Standard Sanitary Corp., Pittsburgh, Pa.
● Burnham Boiler Corp., Irvington, N. Y.
Clifford Mfg. Co., Boston, Mass. (for aircraft)
Clow & Sons, James B., Chicago, Ill. (Gas fired)
Columbia Radiator Co., McKeesport, Pa.
● Crane Co., Chicago, Ill.
Fowler & Wolfe Radiator Co., Norristown, Pa.
International Heater Co., Utica, N. Y.
Kohler Co., Kohler, Wis.
National Radiator Co., The, Johnstown, Pa.
Pierce Butler Radiator Corp., Syracuse, N. Y.
Slater Mfg. Co., Wakefield, Mass. (Baseboard)
● Smith Co., Inc., H. B., The, Westfield, Mass.
Thatcher Furnace Co., Garwood, N. J.
United States Radiator Corp., Detroit, Mich.
Utica Radiator Corp., Utica, N. Y.
Weil-McLain Co., Chicago, Ill.

RADIATOR AND CONVECTOR HUMIDIFIERS

See Humidifiers for Radiators and Convectors

RADIATOR HANGERS

See Hangers or Brackets, Radiator

RADIATOR ORIFICE VALVES

See Valves, Radiator, Orifice

RADIATOR ORIFICES

See Orifices, Radiator

RADIATOR VALVES

See Valves, Radiator

RADIATORS, GAS FIRED

Automatic Gas Equipment Co., Pittsburgh, Pa.

RADIATORS, HUMIDIFYING

● Burnham Boiler Corp., Irvington, N. Y.
Utica Radiator Corp., Utica, N. Y.

RADIATOR VENT VALVE HUMIDIFIERS

See Humidifiers, Radiator Vent Valve

RATCHET WRENCHES

See Wrenches, Ratchet

REAMERS, PIPE

American Pipe Tool Co., Chicago, Ill.
Armstrong Bros. Tool Co., Chicago, Ill.
Armstrong Mfg. Co., Bridgeport, Conn.
Beaver Pipe Tools, Inc., Warren, O.
Crown Die & Tool Co., Chicago, Ill.
Greenfield Tap & Die Corp., Greenfield, Mass.
Independent Pneumatic Tool Co., Chicago, Ill.
Mueller Co., Decatur, Ill.
Nye Tool & Machine Co., Chicago, Ill.
Sac Tool Mfg. Co., St. Louis, Mo.
Toledo Pipe Threading Machine Co., Toledo, O.

RECIPROCATING PUMPS

See Pumps, Reciprocating

RECORDER-CONTROLLERS, COMBINED TEMPERATURE AND HUMIDITY

American Schaeffer & Budenberg Instrument Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn.
Bristol Co., Waterbury, Conn.
Brown Instrument Co., Div. of Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.
Fischer & Porter Co., Hatboro, Pa.
Foxboro Co., Foxboro, Mass.
Mason-Neilan Regulator Co., Boston, Mass.
● Powers Regulator Co., Chicago, Ill.
Scientific Instrument Co., Detroit, Mich.
Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
Taylor Instrument Companies, Rochester, N. Y.
Trerice Co., H. O., Detroit, Mich.

RECORDER-CONTROLLERS, HUMIDITY

American Schaeffer & Budenberg Instrument Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn.
● Barber-Colman Co., Rockford, Ill.
Bristol Co., Waterbury, Conn.
Brown Instrument Co., Div. of Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.
Foxboro Co., Foxboro, Mass.
● Johnson Service Co., Milwaukee, Wis.
● Leeds & Northrup Co., Philadelphia, Pa.
Mason-Neilan Regulator Co., Boston, Mass.

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● Powers Regulator Co., Chicago, Ill.
Scientific Instrument Co., Detroit, Mich.
Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
Taylor Instrument Companies, Rochester, N. Y.
Trerice Co., H. O., Detroit, Mich.

RECORDER-CONTROLLERS, PRESSURE

American Schaeffer & Budenberg Instrument Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn.
Bailey Meter Co., Cleveland, O.
Bristol Co., Waterbury, Conn.
Brown Instrument Co., Div. of Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.
Defender Automatic Regulator Co., St. Louis, Mo.
Fischer & Porter Co., Hatboro, Pa.
Foxboro Co., Foxboro, Mass.
● Hays Corp., Michigan City, Ind.
Mason-Neilan Regulator Co., Boston, Mass.
Scientific Instrument Co., Detroit, Mich.
Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
Taylor Instrument Companies, Rochester, N. Y.
Tomlee Tool & Engineering Co., Minneapolis, Minn.
Trerice Co., H. O., Detroit, Mich.
Wheelco Instruments Co., Chicago, Ill.

RECORDER-CONTROLLERS, TEMPERATURE

American Schaeffer & Budenberg Instrument Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn.
Bailey Meter Co., Cleveland, O.
Bristol Co., Waterbury, Conn.
Brown Instrument Co., Div. of Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.
Defender Automatic Regulator Co., St. Louis, Mo.
Foxboro Co., Foxboro, Mass.
● Johnson Service Co., Milwaukee, Wis.
● Leeds & Northrup Co., Philadelphia, Pa.
Marsh Corp., Jas. P., Chicago, Ill.
Mason-Neilan Regulator Co., Boston, Mass.
● Powers Regulator Co., Chicago, Ill.
Pyrometer Instrument Co., New York, N. Y.
Scientific Instrument Co., Detroit, Mich.
Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
Taylor Instrument Companies, Rochester, N. Y.
Thwing-Albert Instrument Co., Philadelphia, Pa.
Tomlee Tool & Engineering Co., Minneapolis, Minn.
Trerice Co., H. O., Detroit, Mich.
Wheelco Instruments Co., Chicago, Ill.

RECORDERS, CARBON DIOXIDE

American Schaeffer & Budenberg Instrument Div., Manning Maxwell & Moore, Inc., Bridgeport, Conn.
Defender Automatic Regulator Co., St. Louis, Mo.
Engelhard, Inc., Charles, Newark, N. J.
Fischer & Porter Co., Hatboro, Pa.
Foxboro Co., Foxboro, Mass.
● Hays Corp., Michigan City, Ind.
Huyette Co., Inc., Paul B., Philadelphia, Pa.
● Leeds & Northrup Co., Philadelphia, Pa.
Permutit Co., New York, N. Y.
Precision Control Co., San Francisco, Calif.
Republic Flow Meters Co., Chicago, Ill.
Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
Uehling Instrument Co., Paterson, N. J.

RECORDERS, COMBINED TEMPERATURE AND HUMIDITY

American Schaeffer & Budenberg Instrument Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn.
Bristol Co, Waterbury, Conn.
Brown Instrument Co., Div. of Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.
Foxboro Co., Foxboro, Mass.
Friez Instrument Div., Bendix Aviation Corp., Towson, Md.
Mason-Neilan Regulator Co., Boston, Mass.
Moeller Instrument Co., Richmond Hill, N. Y.
● Powers Regulator Co., Chicago, Ill.
Scientific Instrument Co., Detroit, Mich.
Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
Taylor Instrument Companies, Rochester, N. Y.
Trerice Co., H. O., Detroit, Mich.

RECORDERS, DRAFT

American Schaeffer & Budenberg Instrument Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn.
Bacharach Industrial Instrument Co., Pittsburgh, Pa.
Bailey Meter Co., Cleveland, O.
Bristol Co., Waterbury, Conn.
Brown Instrument Co., Div. of Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.
Defender Automatic Regulator Co., St. Louis, Mo.
Foxboro Co., Foxboro, Mass.
● Hays Corp., Michigan City, Ind.
Huyette Co., Inc., Paul B., Philadelphia, Pa.
Mason-Neilan Regulator Co., Boston, Mass.
Republic Flow Meters Co., Chicago, Ill.
Tomlee Tool & Engineering Co., Minneapolis, Minn.
Uehling Instrument Co., Paterson, N. J.
Wheelco Instruments Co., Chicago, Ill.

RECORDERS, HUMIDITY

American Schaeffer & Budenberg Instrument Div., Manning Maxwell & Moore, Inc., Bridgeport, Conn.
Bristol Co., Waterbury, Conn.
Brown Instrument Co., Div. of Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.
Foxboro Co., Foxboro, Mass.
Friez Instrument Div., Bendix Aviation Corp., Towson, Md.
H-B Instrument Co., Philadelphia, Pa.
● Leeds & Northrup Co., Philadelphia, Pa.
Mason-Neilan Regulator Co., Boston, Mass.
Moeller Instrument Co., Richmond Hill, N. Y.
● Powers Regulator Co., Chicago, Ill.
Scientific Instrument Co., Detroit, Mich.
Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
Taylor Instrument Companies, Rochester, N. Y.
Trerice Co., H. O., Detroit, Mich.

RECORDERS, LIQUID LEVEL

American Schaeffer & Budenberg Instrument Div., Manning Maxwell & Moore, Inc., Bridgeport, Conn.
Bailey Meter Co., Cleveland, O.
Bristol Co., Waterbury, Conn.
Brown Instrument Co., Div. of Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.
● Builders-Providence, Inc., Div. of Builders Iron Foundry, Providence, R. I.
Cochrane Corp., Philadelphia, Pa.
Fischer & Porter Co., Hatboro, Pa.
Foxboro Co., Foxboro, Mass.
Huyette Co., Inc., Paul B., Philadelphia, Pa.
● Leeds & Northrup Co., Philadelphia, Pa.
Liquidometer Corp., Long Island City, N. Y.
Mason-Neilan Regulator Co., Boston, Mass.
Morey & Jones, Ltd., Los Angeles, Calif.
Republic Flow Meters Co., Chicago, Ill.
Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
Taylor Instrument Companies, Rochester, N. Y.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

RECORDERS, PRESSURE AND VACUUM

American Schaeffer & Budenberg Instrument Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn.
Bacharach Industrial Instrument Co., Pittsburgh, Pa.
Bailey Meter Co., Cleveland, O.
Bristol Co., Waterbury, Conn.
Brown Instrument Co., Div. of Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.
Cochrane Corp., Philadelphia, Pa.
Defender Automatic Regulator Co., St. Louis, Mo.
Electric Auto-Lite Co., Moto Meter Gauge & Equipment Div., La Crosse, Wis.
Foxboro Co., Foxboro, Mass.
● Hays Corp., Michigan City, Ind.
● Leeds & Northrup Co., Philadelphia, Pa.
Marsh Corp., Jas. P., Chicago, Ill.
Mason-Neilan Regulator Co., Boston, Mass.
Moeller Instrument Co., Richmond Hill, N. Y.
Republic Flow Meters Co., Chicago, Ill.
Scientific Instrument Co., Detroit, Mich.
Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
Taylor Instrument Companies, Rochester, N. Y.
Tomlee Tool & Engineering Co., Minneapolis, Minn.
Trerice Co., H. O., Detroit, Mich.
Uehling Instrument Co., Paterson, N. J.
● United States Gauge Co., New York, N. Y.

RECORDERS, TEMPERATURE

American Schaeffer & Budenberg Instrument Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn.
Bailey Meter Co., Cleveland, O.
Bristol Co., Waterbury, Conn.
Brown Instrument Co., Div. of Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.
Cochrane Corp., Philadelphia, Pa.
Defender Automatic Regulator Co., St. Louis, Mo.
Electric Auto-Lite Co., Moto Meter Gauge & Equipment Div., La Crosse, Wis.
Engelhard, Inc., Charles, Newark, N. J.
Foxboro Co., Foxboro, Mass.
Friez Instrument Div., Bendix Aviation Corp., Towson, Md
H-B Instrument Co., Philadelphia, Pa.
● Hays Corp., Michigan City, Ind.
● Leeds & Northrup Co., Philadelphia, Pa.
Marsh Corp., Jas. P., Chicago, Ill.
Mason-Neilan Regulator Co., Boston, Mass.
Moeller Instrument Co., Richmond Hill, N. Y.
Palmer Co., Cincinnati (Norwood), O.
● Powers Regulator Co., Chicago, Ill.
Practical Instrument Co., Chicago, Ill.
Preferred Utilities Co., Inc., New York, N. Y.
Pyrometer Instrument Co., New York, N. Y.
Republic Flow Meters Co., Chicago, Ill.
Scientific Instrument Co., Detroit, Mich.
Standard Thermometer, Inc., Boston, Mass.
Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
Taylor Instrument Companies, Rochester, N. Y.
Thwing-Albert Instrument Co., Philadelphia, Pa.

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Trerice Co., H. O., Detroit, Mich.
Weksler Thermometer Corp., New York, N. Y.
Wheelco Instruments Co., Chicago, Ill.

RECORDING THERMOMETERS

See Recorders, Temperature

RECOVERY EQUIPMENT, AIR

See Adsorbers, Odor

REDUCERS, SPEED

● Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American Pulley Co., Philadelphia, Pa.
Bodine Electric Co., Chicago, Ill.
Boston Gear Wks., Inc., North Quincy, Mass.
De Laval Steam Turbine Co., Trenton, N. J.
General Electric Co., Schenectady, N. Y.
Graham Transmissions, Inc., Milwaukee, Wis.
Ideal Commutator Dresser Co., Sycamore, Ill.
Janette Mfg. Co., Chicago, Ill. (Motorized)
Jones Foundry & Machine Co., W. A., Chicago, Ill.
● Link Belt Co., Philadelphia, Pa.
Medart Co., St. Louis, Mo.
Moore Steam Turbine Div., Worthington Pump & Machinery Corp., Wellsville, N. Y.
Morse Chain Co., Ithaca, N. Y. (Chain speed)
Philadelphia Gear Works, Inc., Philadelphia, Pa.
Poole Foundry & Machine Co., Baltimore, Md.
Smith, Inc., Winfield H., Springville, N. Y.
● Star Electric Motor Co., Bloomfield, N. J.
● Stephens-Adamson Mfg. Co., Aurora, Ill.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

REFRACTORIES AND REFRACTORY CEMENT

Babcock & Wilcox Co., New York, N. Y.
Botfield Refractories Co., Philadelphia, Pa.
Fireline Stove & Furnace Lining Co., Chicago, Ill.
Green Fire Brick Co., A. P., Mexico, Mo.
Johns-Manville, New York, N. Y.
Laclede-Christy Clay Products Co., St. Louis, Mo.
Ludowici-Celadon Co., Chicago, Ill. (insulating)
McLeod & Henry Co., Inc., Troy, N. Y.
Munn and Steele, Inc., Newark, N. J.
Plibrico Jointless Firebrick Co., Chicago, Ill.
Pyrolite Products Co., Cleveland, O.
Quigley Co., Inc., New York, N. Y.
Ramtite Co., The, Chicago, Ill.
Refractory & Insulation Corp., New York, N. Y.
Rex Clay Products Co., Detroit, Mich.
● Rutland Fire Clay Co., Rutland, Vt.
Standard Fuel Engineering Co., Detroit, Mich.
United States Stoneware Co., New York, N. Y.
Universal Zonolite Insulation Co., Chicago, Ill.
Walsh Refractories Corp., St. Louis, Mo.

REFRIGERANT DEHYDRATORS

See Dehydrators, Refrigerant

REFRIGERANT GAS PURGERS

See Purgers, Refrigerant Gas

REFRIGERANTS

Ansul Chemical Co., Marinette, Wis. (methyl chloride, sulphur dioxide)
Armour Ammonia Wks., Chicago, Ill. (ammonia)
Carbide and Carbon Chemicals Corp., New York, N. Y. (Butane, isobutane, propane, ethane)
du Pont de Nemours & Co., Inc., E. I., Electrochemicals Dept., Wilmington, Del. (methyl chloride and methylene chloride, SO_2 trichlorethylene)
du Pont de Nemours & Co., National Ammonia Div., Wilmington, Del. (ammonia, sulphur dioxide, methyl chloride, "Freon-12")
Kinetic Chemicals, Inc., Wilmington, Del. ("Freon," fluorine)
Liquid Carbonic Corp., Chicago, Ill. (carbon dioxide)
Monsanto Chemical Co., Organic Chemicals Div., St. Louis, Mo. (Anhydrous Ammonia)
Pennsylvania Salt Mfg. Co., Philadelphia, Pa. (ammonia)
Pure Carbonic, Inc., New York, N. Y. (carbon dioxide)
Solvay Sales Corp., New York, N. Y.
Virginia Smelting Co., West Norfolk, Va. (Methyl chloride, liquid sulphur dioxide, methylene chloride)

REFRIGERATING COMPRESSORS

See Compressors, Refrigerating

REFRIGERATION ACCUMULATORS

See Accumulators, Refrigeration

REFRIGERATION CONTROLS

See Valves, Refrigeration

REFRIGERATION FITTINGS

See Fittings, Refrigeration

REFRIGERATION MANIFOLDS

See Manifolds, Refrigeration

REFRIGERATION VALVES

See Valves, Refrigeration

REGISTERS

See also Diffusers; Grilles; Panels, Perforated, for Air Diffusion

Air Control Products, Inc., Coopersville, Mich.
Air-O-Fin Register Co., Detroit, Mich.
● Auer Register Co., Cleveland, O.
● Barber-Colman Co., Rockford, Ill.
Best Register Co., Milwaukee, Wis.
Char-Gale Mfg. Co., Minneapolis, Minn.
Davies Air Filter Corp., New York, N. Y.
Diamond Mfg. Co., Wyoming, Pa.
Elsey Metal Specialties Co., Detroit, Mich.
Empire Ventilation Equipment Co., Long Island City, N. Y.
Gillian Mfg. Co., Detroit, Mich.
Hart & Cooley Mfg. Co., Holland, Mich.
Hendrick Mfg. Co., Carbondale, Pa.
Henry Furnace Co., The, Medina, O.
Independent Register Co., Cleveland, O.
Knowles Mushroom Ventilator Co., Montclair, N. J.
Lamneck Products, Inc., Middletown, O.
Middleton Mfg. & Sales Co., Minneapolis, Minn.
● Mueller Furnace Co., L. J., Milwaukee, Wis.
Newman Bros., Inc., Cincinnati, O.
Palmer Mfg. Corp., Phoenix, Ariz.
Register & Grille Mfg. Co., Brooklyn, N. Y.
Rock Island Register Co., Rock Island, Ill.
Standard Stamping & Perforating Co., Chicago, Ill.
Stewart Mfg. Co., Orange, N. J.
● Tuttle & Bailey, Inc., New Britain, Conn.
United States Register Co., Battle Creek, Mich.
Waterloo Register Co., Waterloo, Ia.

REGULATORS, AIR VELOCITY

● Barber-Colman Co., Rockford, Ill.
● Johnson Service Co., Milwaukee, Wis.
● Powers Regulator Co., Chicago, Ill.
● Sarcotherm Controls, Inc., Chicago, Ill.
Wheelco Instruments Co., Chicago, Ill.

REGULATORS, DAMPER SETS

Adams Co., The, Dubuque, Ia.
Air Control Products, Inc., Coopersville, Mich.
● Automatic Products Co., Milwaukee, Wis.
● Barber-Colman Co., Rockford, Ill.
Cole-Sullivan Engineering Co., Minneapolis, Minn.
Fossum, M. H., St. Paul, Minn.
Gerett Corp., M. A., Milwaukee, Wis.
Goese Mfg. Co., Milwaukee, Wis.
Hart & Cooley Mfg. Co., Holland, Mich.
Joal Mfg. Corp., Toledo, O.
Kerentoff, G. L., Cincinnati, O.
● Kieley & Mueller, Inc., North Bergen, N. J.
Martens & Stormoen, Boston, Mass.
● Mercoid Corp., The, Chicago, Ill.
● Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
Northern Weatherstrip Co., Duluth, Minn.
Ohio Products Co., Cleveland, O.
Parker-Kalon Corp., New York, N. Y.
● Penn Electric Switch Co., Goshen, Ind.
Perfex Corp., Milwaukee, Wis.
Richmond Radiator Co., Gas Products Div., Uniontown, Pa.
Sampsel Time Control, Inc., Spring Valley, Ill.
● Sarcotherm Controls, Inc., Chicago, Ill.
● Thrush & Co., H. A., Peru, Ind.
● Trane Co., The, LaCrosse, Wis.
United States Register Co., Battle Creek, Mich.
Young Regulator Co., Cleveland, O.

REGULATORS, DRAFT, COMBUSTION

Askania Regulator Co., Chicago, Ill.
Au-Temp-Co Corp., New York, N. Y.
Automatic Products Co., Milwaukee, Wis.
Bailey Meter Co., Cleveland, O.
Boiler Room Equipment, Inc., New York, N. Y.
Bristol Co., Waterbury, Conn.
Brooke Engineering Co., Inc., Philadelphia, Pa.
Brown Instrument Co., Div. of Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.
Burrows Mfg. Co., F. A., York, Pa.
● Cash Co., A. W., Decatur, Ill.
Cole-Sullivan Engineering Co, Minneapolis, Minn.
Davis Regulator Co., Chicago, Ill.
Defender Automatic Regulator Co., St. Louis, Mo.
Engineer Co., New York, N. Y.
Foster Engineering Co., Newark, N. J.
Foxboro Co., Foxboro, Mass.
Gilbert & Barker Mfg. Co., West Springfield, Mass.
Hagan Corp., Pittsburgh, Pa.
● Hays Corp., Michigan City, Ind.
● Hotstream Heater Co., Cleveland, O.

● Advertisement in this issue. See Index to Advertisers, page 322.

● Illinois Engineering Co., Chicago, Ill.
● Kieley & Mueller, Inc., North Bergen, N. J.
● Leeds & Northrup Co., Philadelphia, Pa.
Locke Regulator Co., Salem, Mass.
Mason-Neilan Regulator Co., Boston, Mass.
● Mercoid Corp., The, Chicago, Ill.
● Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
National Brass Co., Grand Rapids, Mich.
Perfex Corp., Milwaukee, Wis.
Pioneer Heat Regulator Div., Master Electric Co., The, Dayton, O.
Precision Control Co., San Francisco, Calif.
● Reading-Pratt & Cady Div., American Chain & Cable Co., Inc., Reading, Pa.
Republic Flow Meters Co., Chicago, Ill. (Industrial)
Ruggles-Klingeman Mfg. Co., Salem, Mass.
Sampsel Time Control, Inc., Spring Valley, Ill.
● Sarcotherm Controls, Inc., Chicago, Ill.
Schade Valve Mfg. Co., Philadelphia, Pa.
Shallcross Controls, Inc., Milwaukee, Wis.
Spence Engineering Co., Inc., Walden, N. Y.
Tagliabue Mfg. Co., C. J., Brooklyn, N. Y
● Webster Engineering Co., Tulsa, Okla.
Wheelco Instruments Co., Chicago, Ill.

REGULATORS, PRESSURE, AIR

American Meter Co., Inc., New York, N. Y.
Askania Regulator Co., Chicago, Ill.
Atlas Valve Co., Inc., Newark, N. J.
● Barber-Colman Co., Rockford, Ill.
Belfield Co., H., Philadelphia, Pa.
Boylston Steam Specialty Co., Chicago, Ill.
Brooke Engineering Co., Inc., Philadelphia, Pa.
● Cash Co., A. W., Decatur, Ill.
Cash Valve Mfg. Co., A. W., Decatur, Ill.
Cooper Co, Clark, Palmyra, N. J.
Davis Regulator Co., Chicago, Ill.
Defender Automatic Regulator Co., St. Louis, Mo.
DeVilbiss Co., The, Toledo, O.
Dockson Corp., Detroit, Mich.
● Fisher Governor Co., Marshalltown, Ia.
Foster Engineering Co., Newark, N. J.
● Fulton Sylphon Co., The, Knoxville, Tenn.
Grove Regulator Co., Oakland, Calif.
Hagan Corp., Pittsburgh, Pa.
Hanlon-Waters, Inc., Tulsa, Okla.
● Hays Corp., Michigan City, Ind.
● Hotstream Heater Co., Cleveland, O.
● Illinois Engineering Co., Chicago, Ill.
Keckley Co., O. C., Chicago, Ill.
Klipfel Mfg. Co., Chicago, Ill.
Leslie Co., Lyndhurst, N. J.
Mason-Neilan Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
● Mercoid Corp., The, Chicago, Ill.
Milburn Co., Alexander, Baltimore, Md.
Monitor Controller Co., The, Baltimore, Md.
Mueller Co., Decatur, Ill.
Mueller Steam Specialty Co., Inc., Long Island City, N. Y.
Norgren Co., C. A., Denver, Colo.
North Penn Co., New York, N. Y.
● Penn Electric Switch Co., Goshen, Ind.
Pittsburgh Equitable Meter Co., Pittsburgh, Pa.
● R-S Products Corp., Philadelphia, Pa.
● Reading-Pratt & Cady Div., American Chain & Cable Co., Inc., Reading, Pa.
Ruggles-Klingemann Mfg. Co., Salem, Mass.
Schade Valve Mfg. Co., Philadelphia, Pa.
Spence Engineering Co., Inc., Walden, N. Y.
Spray Engineering Co., Somerville, Mass.
Square D Co., Detroit, Mich.
Square D Co., Industrial Controller Div., Milwaukee, Wis.
Strong, Carlisle & Hammond Co., Cleveland, O.
Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
Taylor Instrument Companies, Rochester, N. Y.
Torchweld Equipment Div., National Cylinder Gas Co., Chicago, Ill.
Trerice Co., H. O., Detroit, Mich.
Tryco Products, Inc., Westfield, Mass.
United Electric Controls Co., Boston, Mass.
Watson & McDaniel Co., Philadelphia, Pa.
Wheelco Instruments Co., Chicago, Ill.
● White-Rodgers Electric Co., St. Louis, Mo.

REGULATORS, PRESSURE, GAS

American Meter Co., Inc., New York, N. Y.
Askania Regulator Co., Chicago, Ill.
Atlas Valve Co., Inc., Newark, N. J.
● Barber-Colman Co., Rockford, Ill.
Barber Gas Burner Co., Cleveland, O.
Belfield Co., H., Philadelphia, Pa.
Boylston Steam Specialty Co., Chicago, Ill.
Bristol Co., Waterbury, Conn.
Brooke Engineering Co., Inc., Philadelphia, Pa.
Brown Instrument Co., Div. of Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.
● Cash Co., A. W., Decatur, Ill.
Cash Valve Mfg. Co., A. W., Decatur, Ill.
Chaplin-Fulton Mfg Co., Pittsburgh, Pa.
Cooper Co., Clark, Palmyra, N. J.
Davis Regulator Co., Chicago, Ill.
Defender Automatic Regulator Co., St. Louis, Mo.
Dockson Corp., Detroit, Mich.
Eclipse Fuel Engineering Co., Rockford, Ill.
● Fisher Governor Co., Marshalltown, Ia.
Foster Engineering Co., Newark, N. J.
Fox Control & Mfg. Co., Cleveland, O.
Foxboro Co., Foxboro, Mass.
Friez Instrument Div., Bendix Aviation Corp., Towson, Md.
● General Controls Co., Glendale, Calif.
Grove Regulator Co., Oakland, Calif.
Hagan Corp., Pittsburgh, Pa.
Hanlon-Waters, Inc., Tulsa, Okla.
● Hays Corp., Michigan City, Ind.
● Illinois Engineering Co., Chicago, Ill.
● Kieley & Mueller, Inc., North Bergen, N. J.
Klipfel Mfg. Co., Chicago, Ill.
Leslie Co., Lyndhurst, N. J.
Liquid Carbonic Corp., The, Chicago, Ill.
Mason-Neilan Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
● Mercoid Corp., The, Chicago, Ill.
Milburn Co., Alexander, Baltimore, Md.
Monitor Controller Co., The, Baltimore, Md.
Mueller Co., Decatur, Ill.
Mueller Steam Specialty Co., Inc., Long Island City, N. Y.
Norgren Co., C. A., Denver, Col.
Payne Furnace & Supply Co., Inc., Beverly Hills, Calif.
Pittsburgh Equitable Meter Co., Pittsburgh, Pa.
● Powers Regulator Co., Chicago, Ill.
● R-S Products Corp., Philadelphia, Pa.
● Reading-Pratt & Cady Div., American Chain & Cable Co., Inc., Reading, Pa.
Republic Flow Meters Co., Chicago, Ill. (Industrial)
Ruggles-Klingemann Mfg. Co., Salem, Mass.
Schade Valve Mfg. Co., Philadelphia, Pa.
Shallcross Controls, Inc., Milwaukee, Wis.
Spence Engineering Co., Inc., Walden, N. Y.
Square D Co., Detroit, Mich.
Staples & Pfeiffer, Ltd., San Francisco, Calif.
Strong, Carlisle & Hammond Co., Cleveland, O.
Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
Taylor Instrument Companies, Rochester, N. Y.
Torchweld Equipment Div., National Cylinder Gas Co., Chicago, Ill.
Trerice Co., H. O., Detroit, Mich.
Victor Equipment Co., San Francisco, Calif.
Watson & McDaniel Co., Philadelphia, Pa.
Wheelco Instruments Co., Chicago, Ill.

REGULATORS, PRESSURE, HOT WATER HEATING SYSTEMS

● Barber-Colman Co., Rockford, Ill.
Beaton & Cadwell Mfg. Co., New Britain, Conn.
● Bell & Gossett Co., Morton Grove, Ill.
Cash Valve Mfg. Co., A. W., Decatur, Ill.
Chicago Specialty Mfg. Co., Chicago, Ill.
● Fisher Governor Co., Marshalltown, Ia.
● Illinois Engineering Co., Chicago, Ill.
Kainer Co., Chicago, Ill.
Kehm Corp., The, Chicago, Ill.
● Mercoid Corp., The, Chicago, Ill.
Mueller Co., Decatur, Ill.
Penberthy Injector Co., Detroit, Mich.
● Reading-Pratt & Cady Div., American Chain & Cable Co., Inc., Reading, Pa.
● Sarcotherm Controls, Inc., Chicago, Ill.
Schade Valve Mfg. Co., Philadelphia, Pa.
Taco Heaters, Inc., New York, N. Y.
● Thrush & Co., H. A., Peru, Ind.
● Trane Co., The, LaCrosse, Wis.
Watts Regulator Co., Lawrence, Mass.
Wheelco Instruments Co., Chicago, Ill.
● White-Rodgers Electric Co., St. Louis, Mo.

REGULATORS, PRESSURE, LIQUID

Atlas Valve Co., Inc., Newark, N. J.
Automatic Control Co., St. Paul, Minn.
Bailey Meter Co., Cleveland, O.
● Barber-Colman Co., Rockford, Ill.
Beaton & Cadwell Mfg. Co., New Britain, Conn.
Belfield Co., H., Philadelphia, Pa.
Boylston Steam Specialty Co., Chicago, Ill.
Bristol Co., Waterbury, Conn.
Brooke Engineering Co., Inc., Philadelphia, Pa.
Brown Instrument Co., Div. of Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.
● Cash Co., A. W., Decatur, Ill.
Cash Valve Mfg. Co., A. W., Decatur, Ill.
Chaplin-Fulton Mfg Co., Pittsburgh, Pa.
Clark Controller Co., Cleveland, O.
Cooper Co., Clark, Palmyra, N. J.
Davis Regulator Co., Chicago, Ill.
Defender Automatic Regulator Co., St. Louis, Mo.
● Fisher Governor Co., Marshalltown, Ia.
Foster Engineering Co., Newark, N. J.
Foxboro Co., Foxboro, Mass.
General Sales & Products Co., Cohoes, N. Y.
Golden-Anderson Valve Specialty Co., Pittsburgh, Pa.

● Advertisement in this issue. See Index to Advertisers, page 322.

Grove Regulator Co., Oakland, Calif.
Hagan Corp., Pittsburgh, Pa.
Hanlon-Waters, Inc., Tulsa, Okla.
Healy Ruff Co., St. Paul, Minn.
● Illinois Engineering Co., Chicago, Ill.
● Johnson Service Co., Milwaukee, Wis.
Justus Steam Trap Co., Napanoch, N. Y.
Keckley Co., O. C., Chicago, Ill.
● Kieley & Mueller, Inc., North Bergen, N. J.
Klipfel Mfg. Co., Chicago, Ill.
Leslie Co., Lyndhurst, N. J.
Locke Regulator Co., Salem, Mass.
Marsh Corp., Jas. P., Chicago, Ill.
Mason-Neilan Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
● McDonnell & Miller, Chicago, Ill.
● Mercoid Corp., The, Chicago, Ill.
● Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
Monarch Mfg. Wks., Inc., Philadelphia, Pa.
Monitor Controller Co., The, Baltimore, Md.
Mueller Co., Decatur, Ill.
Mueller Steam Specialty Co., Inc., Long Island City, N. Y.
Norgren Co., C. A., Denver, Colo.
Perfex Corp., Milwaukee, Wis.
● Powers Regulator Co., Chicago, Ill.
● Reading-Pratt & Cady Div., American Chain & Cable Co., Inc., Reading, Pa.
Republic Flow Meters Co., Chicago, Ill.
Ruggles-Klingemann Mfg. Co., Salem, Mass.
Schade Valve Mfg. Co., Philadelphia, Pa.
Schaub Engineering Co., Fred H., Chicago, Ill.
Shallcross Controls, Inc., Milwaukee, Wis.
Spence Engineering Co., Inc., Walden, N. Y.
Square D Co., Detroit, Mich.
Square D Co., Industrial Controller Div., Milwaukee, Wis.
Staples & Pfeiffer, Ltd., San Francisco, Calif.
Stickle Steam Specialties Co., Indianapolis, Ind.
Strong, Carlisle & Hammond Co., Cleveland, O.
Swartwout Co., Cleveland, O.
Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
Taylor Instrument Companies, Rochester, N. Y.
Trerice Co., H. O., Detroit, Mich.
Tryco Products, Inc., Westfield, Mass.
United Electric Controls Co., Boston, Mass.
Watson & McDaniel Co., Philadelphia, Pa.
Watts Regulator Co., Lawrence, Mass.
Wheelco Instruments Co., Chicago, Ill.
● White-Rodgers Electric Co., St. Louis, Mo.
Williams Gauge Co., Pittsburgh, Pa. (Feed water)

REGULATORS, STATIC PRESSURE, AIR DUCT

● Barber-Colman Co., Rockford, Ill.
Bristol Co., Waterbury, Conn.
● Cash Co., A. W., Decatur, Ill.
● Hays Corp., Michigan City, Ind.
● Hotstream Heater Co., Cleveland, O.
● Johnson Service Co., Milwaukee, Wis.
● Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
● Powers Regulator Co., Chicago, Ill.

REGULATORS, TEMPERATURE

American Instrument Co., Silver Spring, Md.
American Schaeffer & Budenberg Instrument Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn.
Armstrong Heat Control Co., Portland, Ore.
Atlas Valve Co., Inc., Newark, N. J.
Au-Temp-Co Corp., New York, N. Y.
● Automatic Products Co., Milwaukee, Wis.
● Barber-Colman Co., Rockford, Ill.
Bristol Co., Waterbury, Conn.
Brown Instrument Co., Div. of Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.
Burling Instrument Co., Newark, N. J.
Cook Electric Co., Chicago, Ill.
Cooper Co., Clark, Palmyra, N. J.
Defender Automatic Regulator Co., St. Louis, Mo.
● Detroit Lubricator Co., Detroit, Mich.
● Dunham Co., C. A., Chicago, Ill.
Eastern Engineering Co., New Haven, Conn.
Eclipse Fuel Engineering Co., Rockford, Ill.
● Edison, Inc., Thomas A., Instrument Div., West Orange, N. J.
Electrimatic Div., The, of the Simoniz Co., Chicago, Ill.
Foster Engineering Co., Newark, N. J.
Foxboro Co., Foxboro, Mass.
Friez Instrument Div., Bendix Aviation Corp., Towson, Md.
● Fulton Sylphon Co., Knoxville, Tenn.
● General Controls Co., Glendale, Calif.
H-B Instrument Co., Philadelphia, Pa.
Hagan Corp., Pittsburgh, Pa.
Hart Mfg. Co., The, Hartford, Conn.
● Hays Corp., Michigan City, Ind.
● Illinois Engineering Co., Chicago, Ill.
● Johnson Service Co., Milwaukee, Wis.
Keckley Co., O. C., Chicago, Ill.
Klipfel Mfg. Co., Chicago, Ill.
Lawler Automatic Controls, Mount Vernon, N. Y.
● Leeds & Northrup Co., Philadelphia, Pa.
Leslie Co., Lyndhurst, N. J.
Locke Regulator Co., Salem, Mass.
Marsh Corp., Jas. P., Chicago, Ill.
Marsh Tritrol Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
McCorkle Co., D. H., Berkeley, Calif.
● Mercoid Corp., Chicago, Ill.
● Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
● Penn Electric Switch Co., Goshen, Ind.
Perfex Corp., Milwaukee, Wis.
Pioneer Heat Regulator Div., Master Electric Co., The, Dayton, O.
● Powers Regulator Co., Chicago, Ill.
Precision Thermometer & Instrument Co., Philadelphia, Pa.
Pyrometer Instrument Co., New York, N. Y.
Ranco, Inc., Columbus, O.
● Reading-Pratt & Cady Div., American Chain & Cable Co., Inc., Reading, Pa.
Ruggles-Klingemann Mfg. Co., Salem, Mass.
● Sarco Co., Inc., New York, N. Y.
● Sarcotherm Controls, Inc., Chicago, Ill.
Scientific Instrument Co., Detroit, Mich.
Spence Engineering Co., Inc., Walden, N. Y.
Spencer Thermostat Co., Attleboro, Mass.
Square D Co., Detroit, Mich.
● Sterling, Inc., Milwaukee, Wis.
Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
Taylor Instrument Companies, Rochester, N. Y.
Trerice Co., H. O., Detroit, Mich.
Triplex Heating Specialty Co., Peru, Ind.
United Electric Controls Co., Boston, Mass.
Vapor Car Heating Co., Inc., Chicago, Ill.
Watson & McDaniel Co., Philadelphia, Pa.
Wheelco Instruments Co., Chicago, Ill.
White Mfg. Co., St. Paul, Minn.
● White-Rodgers Electric Co., St. Louis, Mo.

RELAYS, ELECTRICAL

Advance Electric Co., Los Angeles, Calif.
Allen-Bradley Co., Milwaukee, Wis.
American Instrument Co., Silver Spring, Md.
Arrow-Hart & Hegeman Elect. Co., Hartford, Conn.
Au-Temp-Co Corp., New York, N. Y.
Automatic Switch Co., New York, N. Y.
Automatic Temperature Control Co., Inc., Philadelphia, Pa.
B/W Controller Corp., Birmingham, Mich.
● Barber-Colman Co., Rockford, Ill.
Bardco Mfg. & Sales Co., Los Angeles, Calif.
Benjamin Electric Mfg. Co., Des Plaines, Ill.
Clark Controller Co., Cleveland, O.
Consolidated Car-Heating Co., Inc., Albany, N. Y.
Cook Electric Co., Chicago, Ill.
Cooper Co., Clark, Palmyra, N. J.
Cramer Co., Inc., R. W., The, Centerbrook, Conn.
Cutler-Hammer, Inc., Milwaukee, Wis.
Davis & Co., Inc., Dean W., Chicago, Ill.
● Detroit Lubricator Co., Detroit, Mich.
Dunn, Inc., Struthers, Philadelphia, Pa.
Durakool, Inc., Elkhart, Ind.
Eastern Air Devices, Inc., Brooklyn, N. Y.
● Edison, Inc., Thos. A., Instrument Div., West Orange, N. J.
Friez Instrument Div., Bendix Aviation Corp., Towson, Md.
● General Controls Co., Glendale, Calif.
General Electric Co., Schenectady, N. Y.
Gleason-Avery, Inc., Auburn, N. Y.
Guardian Electric Mfg. Co., Chicago, Ill.
H-B Instrument Co., Philadelphia, Pa.
Hart Mfg. Co., Hartford, Conn.
Industrial Engineering Corp., Terre Haute, Ind.
Jefferson Electric Co., Bellwood, Ill.
McCorkle Co., D. H., Berkeley, Calif.
● Mercoid Corp., Chicago, Ill.
● Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
Monitor Controller Co., The, Baltimore, Md.
National Time & Signal Corp., Detroit, Mich.
● Penn Electric Switch Co., Goshen, Ind.
Perfex Corp., Milwaukee, Wis.
Philadelphia Thermometer Co., Philadelphia, Pa.
Precision Thermometer & Instrument Co., Philadelphia, Pa.
Sampsel Time Control, Inc., Spring Valley, Ill.
Small Motors, Inc., Chicago, Ill.
Spencer Thermostat Co., Attleboro, Mass.
Square D Co., Milwaukee, Wis.
Struthers Dunn, Inc., Philadelphia, Pa.
Taylor Instrument Companies, Rochester, N. Y.
● Thrush & Co., H. A., Peru, Ind.
Triplex Heating Specialty Co., Peru, Ind.
Ward Leonard Electric Co., Mt. Vernon, N. Y.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Weston Electrical Instrument Corp., Newark, N. J.
● White-Rodgers Electric Co., St. Louis, Mo.
Zenith Electric Co., Chicago, Ill.

RELIEF VALVES

See Valves, Relief

REPAIR CLAMPS

See Clamps, Pipe Repair

RESEATERS, VALVE

Chicago Specialty Mfg. Co., Chicago, Ill.
Economy Valve Seat Co., Chicago, Ill.
Leavitt Machine Co., Orange, Mass.
Standard Reseater Corp., New York, N. Y.

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RINGS, PISTON, FOR COMPRESSORS

American Hammered Piston Ring Div., Koppers Co., Baltimore, Md.
McQuay-Norris Mfg. Co., St. Louis, Mo.
Perfect Circle Co., The, Hagerstown, Ind.
Perfection Refrigeration Parts Co., Harvey, Ill.
Sealed Power Corp., Muskegon, Mich.

RINGS, WELDING

● Tube Turns, Louisville, Ky.

ROD, GAS WELDING

● Air Reduction Sales Co., New York, N. Y.
● American Brass Co., Waterbury, Conn.
American Steel & Wire Co., Cleveland, O.
Bridgeport Brass Co., Bridgeport, Conn.
Chase Brass & Copper Co., Waterbury, Conn.
Chicago Steel & Wire Co., Chicago, Ill.
Crucible Steel Co. of America, New York, N. Y.
Duraloy Co., Scottdale, Pa. (Stainless)
Eutectic Welding Alloys Co., New York, N. Y.
Imperial Brass Mfg. Co., Chicago, Ill.
International Nickel Co., New York, N. Y.
Linde Air Products Co., The, Unit of Union Carbide & Carbon Corp., New York, N. Y.
Liquid Carbonic Corp., The, Chicago, Ill.
Marquette Mfg. Co., Minneapolis, Minn.
Maurath, Inc., Cleveland, O.
Milburn Co., Alexander, Baltimore, Md.
Modern Engineering Co., St. Louis, Mo.
National Cylinder Gas Co., Chicago, Ill.
Page Steel & Wire Division of American Chain & Cable Co., Inc., Monessen, Pa.
Republic Steel Corp., Cleveland, O.
Revere Copper and Brass, Incorporated, New York, N. Y.
Torchweld Equipment Div., National Cylinder Gas Co., Chicago, Ill.
Universal Power Corp., Cleveland, O.
Victor Equipment Co., San Francisco, Calif.
Wickwire Spencer Steel Co., New York, N. Y.
● Youngstown Sheet & Tube Co., Youngstown, O.

ROLLER BEARINGS

See Bearings, Roller

ROOF COOLERS

See Systems, Roof Spraying

ROOF SPRAYING SYSTEMS

See Systems, Roof Spraying

ROOF VENTILATORS

See Ventilators, Roof

ROOM HUMIDIFIERS

See Humidifiers, Unit, Room Type; and Units, Air Conditioning, Winter

ROOM THERMOSTATS

See Thermostats, Room or Wall

ROTARY PUMPS

See Pumps, Rotary

RUBBER BELTING

See Belting, Flat, Rubber

RUBBER PACKING

See Packing, Rubber and Synthetic

RUBBER PIPE

See Pipe, Hard Rubber

SADDLE VALVES

See Valves, Saddle

SAFETY VALVES

See Valves, Safety, Steam

SCREENS, SUN REFLECTING

Ingersoll Steel & Disc Div., Borg-Warner Corp., Chicago, Ill.
Yardley Screen & Weather Strip Co., Columbus, O.

SEAMLESS PIPE

See Pipe, Steel, Seamless

SEPARATORS, AIR

Adams Co., Inc., R. P., Buffalo, N. Y.
American Injector Co., Detroit, Mich.
Bowser, Inc., Fort Wayne, Ind.
Centrifix Corp., Cleveland, O.
Cochrane Corp., Philadelphia, Pa.
● Crane Co., Chicago, Ill.
DeVilbiss Co., The, Toledo, O.
● Dollinger Corp., Rochester, N. Y.
Hagan Corp., Pittsburgh, Pa.
● Illinois Engineering Co., Chicago, Ill.
Johnson Corp., Three Rivers, Mich.
Keckley Co., O. C., Chicago, Ill.
Leavitt Machine Co., Orange, Mass.
Logan Engineering Co., Chicago, Ill.
Milburn Co., Alexander, Baltimore, Md.
Nicholson & Co., W. H., Wilkes-Barre, Pa.
Spencer Turbine Co., Hartford, Conn.
Spray Engineering Co., Somerville, Mass.
Straight Line Foundry & Machine Corp., Direct Separator Div. The, Syracuse, N. Y.
Strong, Carlisle & Hammond Co., Cleveland, O.
Swartwout Co., Cleveland, O.
Textite Corp., Chicago, Ill.
Trerice Co., H. O., Detroit, Mich.
Wright-Austin Co., Detroit, Mich.

SEPARATORS, STEAM AND OIL

Acme Industries, Inc., Jackson, Mich.
Adams Co., Inc., R. P., Buffalo, N. Y.
● American District Steam Co., North Tonawanda, N. Y.
Boylston Steam Specialty Co., Chicago, Ill.
Centrifix Corp., Cleveland, O. (Gas and vapor)
Cochrane Corp., Philadelphia, Pa.
● Crane Co., Chicago, Ill.
Elliott Co., Jeannette, Pa.
● Fisher Governor Co., Marshalltown, Ia.
Frick Co., Waynesboro, Pa.
Hagan Corp., Pittsburgh, Pa.
Hoppes Mfg. Co., Springfield, O.
● Illinois Engineering Co., Chicago, Ill.
Johnson Corp., Three Rivers, Mich.
● Kieley & Mueller, Inc., North Bergen, N. J.
Kisco Boiler & Engineering Co., St. Louis, Mo.
McAlear Mfg. Co., Chicago, Ill.
Morehead Mfg. Co., Detroit, Mich.
National Valve & Mfg. Co., Pittsburgh, Pa.
Nicholson & Co., W. H., Wilkes-Barre, Pa.
Richmond Engineering Co., Inc., Richmond, Va.
Schutte & Koerting Co., Philadelphia, Pa.
Sims Co., Erie, Pa.
Stickle Steam Specialties Co., Indianapolis, Ind.
Straight Line Foundry & Machine Corp., Direct Separator Div. The, Syracuse, N. Y.
Strong, Carlisle & Hammond Co, Cleveland, O.
Swartwout Co., Cleveland, O.
Textite Corp., Chicago, Ill.
● Webster & Co., Warren, Camden, N. J.
Westfalia Separator Co., Bloomfield, N. J.
● Worthington Pump & Machinery Corp., Air Conditioning and Refrigeration Div., Harrison, N. J.
Wright-Austin Co., Detroit, Mich.

SEWAGE EJECTORS

See Ejectors, Sewage

SEWAGE PUMPS

See Pumps, Sewage

SHEARS, ELECTRIC, PORTABLE

Black & Decker Mfg. Co., Towson, Md.
G. D. S. Machinery & Supply Co., Inc., New York, N. Y.
Independent Pneumatic Tool Co., Chicago, Ill.
● O'Neil Irwin Mfg. Co., Minneapolis, Minn.
Skilsaw, Inc., Chicago, Ill.
Stanley Electric Tool Div., The Stanley Works, New Britain, Conn.
Van Dorn Electric Tool Co., Towson, Md.

SHEARS, POWER

Beatty Machine & Mfg. Co., Hammond, Ind.
Bertsch & Co., Inc., Cambridge City, Ind.
Bliss Co., E. W., Toledo, O.
● Buffalo Forge Co., Buffalo, N. Y.
Cincinnati Shaper Co., Cincinnati, O.
Cleveland Punch & Shear Works Co., Cleveland, O.
Excelsior Tool & Machine Co., East St. Louis, Ill.
Heartley Machine & Tool Co., Toledo, O.
Hendley & Whittemore, Beloit, Wis.
Niagara Machine & Tool Wks., Buffalo, N. Y.
● O'Neil Irwin Mfg. Co., Minneapolis, Minn.
Peck, Stow & Wilcox Co., Southington, Conn.
Quickwork Div., Whiting Corp., Harvey, Ill.
Rafter Machine Co., Belleville, N. J.
Rock River Machine Co., Inc., Janesville, Wis.
Whitney Metal Tool Co., Rockford, Ill.
Yoder Co., The, Cleveland, O.

SHEARS AND SNIPS, HAND

Armstrong-Blum Mfg. Co., Chicago, Ill.
Bartlett Mfg. Co., Detroit, Mich.
Beverly Throatless Shear Co., Chicago, Ill.
Bremil Mfg. Co., Erie, Pa.
Clauss Shear Co., Fremont, O.
Crescent Tool Co., Jamestown, N. Y.
Excelsior Tool & Machine Co., East St. Louis, Ill.

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G. D. S. Machine & Supply Co., Inc., New York, N. Y.
Grobet File Corp. of America, New York, N. Y.
Hendley & Whittemore, Beloit, Wis.
Kidder Mfg. Co., Inc., J. F., Burlington, Vt. (Angle)
Niagara Machine & Tool Wks., Buffalo, N. Y.
● O'Neil Irwin Mfg. Co., Minneapolis, Minn.
Peck, Stow & Wilcox Co., Southington, Conn.
Rafter Machine Co., Belleville, N. J.
Snap-On Tools Corp., Kenosha, Wis.
Viking Shear Co., Erie, Pa.
Whitney Metal Tool Co., Rockford, Ill.
Wiss & Sons Co., J., Newark, N. J.

SHEAVES

See Pulleys and Sheaves, for Belt Drives

SHEET METAL BRAKES

See Brakes, Sheet Metal

SHEET METAL DUCTS

See Ducts and Duct Fittings, Prefabricated

SHEET METAL FITTINGS

See Ducts and Duct Fittings, Prefabricated

SHEET METAL PUNCHES

See Punches, Sheet Metal

SHEETS, ALUMINUM

Aluminum Co. of America, Pittsburgh, Pa.
American Nickeloid Co., Peru, Ill. (Nickel and chromium plated)
Fairmont Aluminum Co., Fairmont, W. Va.

SHEETS, ALUMINUM COATED

● American Rolling Mill Co., The, Middletown, O.

SHEETS AND BOARD, NON-METALLIC, FOR DUCT CONSTRUCTION

● Carey Mfg. Co., Philip, Cincinnati, O.
Celotex Corp., The, Chicago, Ill.
● Grant Wilson, Inc., Chicago, Ill.
Johns-Manville, New York, N. Y.
Keasbey & Mattison Co., Ambler, Pa.
Keystone Asphalt Products Co., Chicago, Ill.
Masonite Corp., Chicago, Ill.
Ruberoid Co., New York, N. Y.
● Sall Mountain Co., Chicago, Ill.
● Wilson, Inc., Grant, Chicago, Ill.

SHEETS, CLAD

Allegheny Ludlum Steel Corp., Brackenridge, Pa.
Aluminum Co. of America, Pittsburgh, Pa.
General Plate Div., Metals & Controls Corp., Attleboro, Mass.
Granite City Steel Co., Granite City, Ill. (Stainless)
Ingersoll Steel & Disc Div., Borg-Warner Corp., Chicago, Ill.
Jessop Steel Co., Washington, Pa.
Lamb & Ritchie Co., Cambridge, Mass.
Lukens Steel Co., Coatsville, Pa.

SHEETS, COPPER

● American Brass Co., Waterbury, Conn.
American Nickeloid Co., Peru, Ill. (Nickel and chromium plated)
Bridgeport Brass Co., Bridgeport, Conn.
Chase Brass & Copper Co., Waterbury, Conn.
Conklin Brass & Copper Co., Inc., T. E., New York, N. Y.
Downs-Smith Brass & Copper Co., New York, N. Y.
Hussey & Co., C. G., Pittsburgh, Pa.
National Brass & Copper Co., Inc., Lisbon, O.
New Haven Copper Co., Seymour, Conn.
Revere Copper and Brass, Incorporated, New York, N. Y.
United States Brass & Copper Co., Hyde Park, Boston, Mass.
Western Cartridge Co., Brass Mill Div., East Alton, Ill. (Brass, bronze, phosphor bronze)

SHEETS, LEAD

Alpha Metal & Rolling Mills, Inc., Brooklyn, N. Y.
● American Smelting & Refining Co., New York, N. Y.
Belmont Smelting & Refining Wks., Inc., Brooklyn, N. Y.
Continental Steel Corp., Kokomo, Ind. (Coated)
Downs-Smith Brass & Copper Co., New York, N. Y.
Eagle-Picher Lead Co., Cincinnati, O.
Flemm Lead Co., Inc., Long Island City, N. Y.
Illinois Zinc Co., Chicago, Ill.
Lissberger & Son, Inc., Marks, Long Island City, N. Y.
National Lead Co., New York, N. Y.
Northwest Lead Co., Seattle, Wash.
Rochester Lead Wks., Rochester, N. Y.
Standard Rolling Mills, Inc., Brooklyn, N. Y.
Weirton Steel Co., Weirton, W. Va. (Alloy coated)

SHEETS, MAGNESIUM ALLOY

● Dow Chemical Co., Midland, Mich.

SHEETS, METAL, WITH PROTECTIVE NON-METALLIC COATING

American Steel Band Co., Pittsburgh, Pa.
Cheney Metal Products Co., Trenton, N. J.
Protected Steel Products Co., Washington, Pa.
Technical Ply-Woods, Chicago, Ill. (Metal and plywood)

SHEETS, NICKEL AND NICKEL ALLOY

American Nickeloid Co., Peru, Ill.
Duriron Co., Inc., Dayton, O. (Acid resisting)
General Plate Div., Metals & Controls Corp., Attleboro, Mass.
International Nickel Co., New York, N. Y.
Republic Steel Corp., Cleveland, O.
Revere Copper and Brass Incorporated, New York, N. Y.
Western Cartridge Co., Brass Mill Div., East Alton, Ill.

SHEETS, STEEL, COPPER BEARING

● American Rolling Mill Co., The, Middletown, O.
Bethlehem Steel Co., Bethlehem, Pa.
● Carnegie-Illinois Steel Corp., Pittsburgh, Pa.
● Columbia Steel Co. (Sub. United States Steel Corp.), San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., Chicago, Ill.
Lukens Steel Co., Coatesville, Pa.
Newport Rolling Mill Co., Div. of The Andrews Steel Co., Newport, Ky.
Reeves Steel & Mfg. Co., Dover, O.
Republic Steel Corp., Cleveland, O.
Sharon Steel Corp., Sharon, Pa.
Superior Sheet Steel Co., The, Canton, O.
● Tennessee Coal, Iron & Railroad Co., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.
Wheeling Steel Corp., Wheeling, W. Va.
● Youngstown Sheet & Tube Co., Youngstown, O.

SHEETS, STEEL, GALVANIZED

● American Rolling Mill Co., The, Middletown, O.
American Steel & Wire Co., Cleveland, O.
Apollo Steel Co., Apollo, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
● Carnegie-Illinois Steel Corp., Pittsburgh, Pa.
● Columbia Steel Co. (Sub. United States Steel Corp.), San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Crucible Steel Co. of America, New York, N. Y.
Empire Sheet & Tin Plate Co., Mansfield, O.
Follansbee Steel Corp., Pittsburgh, Pa.
Granite City Steel Co., Granite City, Ill.
Great Lakes Steel Corp., Detroit, Mich.
Inland Steel Co., Chicago, Ill.
Lukens Steel Co., Coatesville, Pa.
Lyon, Conklin & Co., Inc., Baltimore, Md.
Newport Rolling Mill Co., Div. of The Andrews Steel Co., Newport, Ky.
Niles Rolling Mill Co., Niles, O.
Parkersburg Iron & Steel Co., Parkersburg, W. Va.
Reeves Steel & Mfg. Co., Dover, O.
Republic Steel Corp., Cleveland, O.
Sharon Steel Corp., Sharon, Pa.
Superior Sheet Steel Co., The, Canton, O.
● Tennessee Coal, Iron & Railroad Co., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.
Wheeling Steel Corp., Wheeling, W. Va.
Wood Steel Co., Alan, Conshohocken, Pa.
● Youngstown Sheet & Tube Co., Youngstown, O.

SHEETS, STEEL, GALVANNEALED

● Carnegie-Illinois Steel Corp., Pittsburgh, Pa.
Continental Steel Corp., Kokomo, Ind.
Newport Rolling Mill Co., Div. of The Andrews Steel Co., Newport, Ky.
Republic Steel Corp., Cleveland, O.
Sharon Steel Corp., Sharon, Pa.
Superior Sheet Steel Co., The, Div. of Continental Steel Corp., Canton, O.
● Youngstown Sheet & Tube Co., Youngstown, O.

SHEETS, STEEL, STAINLESS

Allegheny Ludlum Steel Corp., Brackenridge, Pa.
● American Rolling Mill Co., The, Middletown, O.
Barium Stainless Steel Corp., Canton, O.
● Carnegie-Illinois Steel Corp., Pittsburgh, Pa.
Colonial Alloys Co., Metals Div., Philadelphia, Pa.
Ingersoll Steel & Disc Div., Borg-Warner Corp., Chicago, Ill.
Jessop Steel Co., Washington, Pa.
Republic Steel Corp., Cleveland, O.
Ryerson & Son, Inc., Jos. T., Chicago, Ill.
Sharon Steel Corp., Sharon, Pa.
Superior Steel Corp., Pittsburgh, Pa.
Universal-Cyclops Steel Corp., Bridgeville, Pa.

SHEETS, WROUGHT IRON

● Byers Co., A. M., Pittsburgh, Pa.

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SHEETS, ZINC

American Nickeloid Co., Peru, Ill. (Nickel and chromium plated)
American Zinc Products Co., Greencastle, Ind.
Belmont Smelting & Refining Wks., Inc., Brooklyn, N. Y.
Downs-Smith Brass & Copper Co., New York, N. Y.
Hegeler Zinc Co., Danville, Ill.
Illinois Zinc Co., Chicago, Ill.
Matthiessen & Hegeler Zinc Co., La Salle, Ill.
New Jersey Zinc Sales Co., New York, N. Y.

SHUTTERS

See Louvers and Shutters

SIGHT GLASSES

See Glasses, Sight, for Pipe Lines

SLEEVE BEARINGS

See Bearings, Sleeve

SLEEVES, PIPE REPAIR

See Clamps, Pipe Repair

SMOKE ALARMS

See Alarms, Smoke

SMOKE GUNS

See Guns and Pots, Smoke and Smudge

SMUDGE POTS

See Guns and Pots, Smoke and Smudge

SOCKET WRENCHES

See Wrenches, Socket

SOLAR HEAT RESISTING SCREENS

See Screens, Sun reflecting

SOLDER (SILVER), BRAZING ALLOYS, AND FLUXES

Alpha Metal & Rolling Mills, Inc., Brooklyn, N. Y.
● American Smelting & Refining Co., New York, N. Y.
Belmont Smelting & Refining Works, Inc., Brooklyn, N. Y.
Chase Brass & Copper Co., Waterbury, Conn.
Conklin Brass & Copper Co., Inc., T. E., New York, N. Y.
Eutectic Welding Alloys Co., New York, N. Y.
General Plate Div., Metals & Controls Corp., Attleboro, Mass.
Handy & Harman, New York, N. Y.
Hardy, Inc., Charles, New York, N. Y.
Industrial Service Laboratories, Milwaukee, Wis.
Johnson Co., Lloyd S., Chicago, Ill.
Lewis Laboratories, Inc., Paul, Milwaukee, Wis.

SOLDER (TIN-LEAD), AND FLUXES

● Air Reduction Sales Co , New York, N. Y.
Alpha Metal & Rolling Mills, Inc., Brooklyn, N. Y.
● American Brass Co., Waterbury, Conn.
● American Smelting & Refining Co., New York, N. Y.
American Solder & Flux Co., Philadelphia, Pa.
Belmont Smelting & Refining Works, Inc., Brooklyn, N. Y.
Benson Co., Inc., Alex R., Hudson, N. Y.
Burnley Battery & Mfg. Co., North East, Pa.
Chase Brass & Copper Co., Waterbury, Conn.
Conklin Brass & Copper Co., Inc., T. E., New York, N. Y.
Eagle-Picher Lead Co., Cincinnati, O.
Flemm Lead Co., Inc., Long Island City, N. Y.
Gardiner Metal Co., Chicago, Ill.
Glaser Lead Co., Inc., Brooklyn, N. Y.
Hercules Chemical Co., Inc., New York, N. Y.
Industrial Service Laboratories, Milwaukee, Wis.
Johnson Co., Lloyd S., Chicago, Ill.
Johnston Tin Foil & Metal Co., The, St. Louis, Mo.
Kester Solder Co., Chicago, Ill.
Klauer Mfg. Co., Dubuque, Ia.
Linde Air Products Co., The, Unit of Union Carbide & Carbon Corp., New York, N. Y.
Lissberger & Son, Inc., Marks, Long Island City, N. Y.
Merchant & Evans Co., Philadelphia, Pa.
National Lead Co., New York, N. Y.
Northwest Lead Co., Seattle, Wash.
Rochester Lead Works, Inc., Rochester, N. Y.
Ruby Chemical Co., Columbus, O.
Ryerson & Son, Inc., Jos. T., Chicago, Ill.
Torchweld Equipment Div., National Cylinder Gas Co., Chicago, Ill.
Utility Laboratory, Inc., Brooklyn, N. Y.
Wolfe-Kote Co., Sheboygan, Wis.

SOLENOID VALVES

See Valves, Solenoid

SOOT BLOWERS

See Blowers, Soot

SOOT DESTROYERS

See Destroyers, Soot, Chemical

SOUND DEADENING FOR CEILING AND WALL

See Insulation, Ceiling and Wall, Sound Deadening

SOUND DEADENING FOR DUCTS

See Insulation, Duct, Sound Deadening

SOUND INDICATORS

See Indicators, Sound Level

SPEED CHANGERS

See Changers, Speed, Hydraulic Coupling; Changers, Speed, Mechanical

SPEED REDUCERS

See Reducers, Speed

SPIRAL PIPE

See Pipe, Spiral, Riveted and Welded

SPOT WELDERS

See Welders, Spot

SPRAY HUMIDIFIERS

See Humidifiers, Direct, Spray Head

SPRAY NOZZLES

See Nozzles, Spray

SPRAY PAINTING BOOTHS

See Booths, Painting, Spray

SPRINKLER HEADS

See Heads, Sprinkler

SPRINKLER SYSTEM CONTROLS

See Controls, Fire Protection Sprinkler Systems; Valves, Fire Protection Sprinkler System Control

STAINLESS STEEL PIPE

See Pipe, Steel, Stainless

STAINLESS STEEL SHEETS

See Sheets, Steel, Stainless

STANDS, PIPE VISE

American Pipe Tool Co.. Chicago, Ill.
Armstrong Mfg. Co., Bridgeport, Conn.
Crown Die & Tool Co., Chicago, Ill.
Hollands Mfg. Co., Erie, Pa.
Martin & Sons, H. P., Owensboro, Ky.
Nye Tool & Machine Co., Chicago, Ill.
Ridge Tool Co., Elyria, O.
Toledo Pipe Threading Machine Co., Toledo, O.
Western Wire Products Co., St. Louis, Mo.
● Williams & Co., J. H., Buffalo, N. Y.

STEAM BOOSTER COMPRESSORS

See Compressors, Steam Booster

STEAM ENGINES

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STEAM JET REFRIGERATION

See Compressors, Refrigerating, Steam Jet

STEAM PRESSURE REGULATORS

See Valves, Pressure Reducing and Regulating

STEAM PUMPS

See Pumps, Steam

STEAM SEPARATORS

See Separators, Steam and Oil

STEAM TRAPS

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STEEL PIPE

See Pipe, Steel

STEEL TUBING

See Tubing, Steel

STEEL UNIONS

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STEEL VALVES

See Valves, Gate; and Valves, Globe

STERILIZING LAMPS

See Lamps, Sterilizing, for Duct Installation

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STOCKS AND DIES

American Pipe Tool Co., Chicago, Ill.
Armstrong Bros. Tool Co., Chicago, Ill.
Armstrong Mfg. Co., Bridgeport, Conn.
Beaver Pipe Tools, Inc., Warren, O.
Champion Blower & Forge Co., Lancaster, Pa.
Crown Die & Tool Co., Chicago, Ill. (Pipe)
Erie Tool Wks., Erie, Pa.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hollands Mfg. Co., Erie, Pa.
Nye Tool & Machine Co., Chicago, Ill.
Oster Mfg. Co., Cleveland, O.
Ridge Tool Co., Elyria, O.
Toledo Pipe Threading Machine Co., Toledo, O.

STOKERS, INDUSTRIAL AND COMMERCIAL

61 to 1200 Lb per Hr

American Coal Burner Co., Chicago, Ill.
Anchor Stove & Range Co., New Albany, Ind.
Auburn Foundry, Inc., Stoker Div., Auburn, Ind.
Babcock & Wilcox Co., New York, N. Y.
Bluffton Mfg. Co., The, Findlay, O.
Bros Boiler & Mfg. Co., Wm., Minneapolis, Minn.
Brownell Co., Dayton, O.
Burke Stoker & Mfg. Co., Chicago, Ill.
Burnham Stoker Co., Vancouver, Wash.
Canton Stoker Corp., Canton, O.
Carnes, Inc., John R., Lima, O.
Catskill Metal Works, Inc., Catskill, N. Y.
Chesapeake & Ohio R. R. Co., Cleveland, O.
Clizbe Bros. Mfg. Co., Plymouth, Ind.
Combustion Engineering Co., Inc., New York, N. Y.
Conco Corp., Div. of H. D. Conkey & Co., Mendota, Ill.
Cooper & Cooper, Pittsfield, Mass.
● Crane Co., Chicago, Ill.
Crown Iron Works, Minneapolis, Minn.
Detroit Stoker Co., Detroit, Mich.
Econocol Stoker Div. of Cotta Transmission Corp., Rockford, Ill.
Eddy Stoker Corp., Chicago, Ill.
Fairbanks, Morse & Co., Chicago, Ill.
Firemood Machine Wks., Converse, Ind.
Flynn & Emrich Co., Baltimore, Md.
Frederick Iron & Steel Co., Frederick, Md.
Fuel Savers, Inc., Harrisburg, Pa.
● Gehl Bros. Mfg. Co., West Bend, Wis.
General Machinery Co., Spokane, Wash.
Grand Rapids Blow Pipe & Dust Arrester Co., Grand Rapids, Mich.
Heating Assurance, Inc., Spokane, Wash.
Her-Born Engrg. & Mfg. Co., Sandusky, O.
Hershey Machine & Foundry Co., Motorstoker Div., Manheim, Pa.
Holcomb & Hoke Mfg. Co., Indianapolis, Ind.
● Illinois Iron & Bolt Co., Chicago, Ill.
International Engineering Wks., Inc., Framingham, Mass.
Iron Fireman Mfg. Co., Cleveland, O.
Kingston Products Corp., Kokomo, Ind.
Kol-Master Corp., Oregon, Ill.
Laclede Stoker Co., St. Louis, Mo.
Leffel & Co., Springfield, O.
● Link-Belt Co., Chicago, Ill.
"Loyal Knight" Stokers, Inc., Belleville, Ill.
Mallory Sales Co., Dolton, Ill.
Meyer Furnace Co., The, Peoria, Ill.
Muncie Gear Wks., Inc., Muncie, Ind.
National Steam Pump Co., Upper Sandusky, O.
Neemes Foundry, Inc., Troy, N. Y.
Northern Steel & Stoker Corp., Peoria, Ill.
Ormsby-Osterman, Inc., St. Louis, Mo.
OverSpred Stoker Co., Chicago, Ill.
Peerless Mfg. Corp., Louisville, Ky.
Perfection Grate & Stoker Co., Springfield, Mass.
Plymouth Industries, Inc., Plymouth, Ind.
Pocahontas Fuel Co., Inc., Stoker Div., Cleveland, O.
Riley Stoker Corp., Worcester, Mass.
Rosedale Foundry & Machine Co., Pittsburgh, Pa.
Schwitzer-Cummins Co., Indianapolis, Ind.
Scott-Newcomb, Inc., St. Louis, Mo.
Sinker-Davis Co., Indianapolis, Ind.
Steel Products Engineering Co., Springfield, O.
Stok-A-Fire Co., University City, Mo.
Stokermatic Co., Salt Lake City, Utah.
Sun-Fire Stoker Corp., New Albany, Ind.
Thermal Engineering Co., Chicago, Ill.
U. S. Machine Corp., Lebanon, Ind.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Whiting Stoker Co., Chicago, Ill.
Whitty Co., Inc., Boston, Mass.
Will-Burt Co., The, Orrville, O.

STONEWARE PIPE

See Pipe, Stoneware

STORAGE WATER HEATERS

See Heaters, Water, Steam, Storage

STRAINERS, PIPE LINE

● Alco Valve Co., St. Louis, Mo.
Alten's Foundry & Machine Works, Lancaster, O.
● American District Steam Co., North Tonawanda, N. Y.
American Injector Co., Detroit, Mich.
● Anderson Co., V. D., The, Cleveland, O.
Barrett, Haentjens & Co., Hazleton, Pa.
Bishop & Babcock Mfg. Co., Cleveland, O.
Blackmer Pump Co., Grand Rapids, Mich.
Bowser, Inc., Fort Wayne, Ind.
Boylston Steam Specialty Co., Chicago, Ill.
● Cash Co., A. W., Decatur, Ill.
Cash Valve Mfg. Co., A. W., Decatur, Ill.
Cashin Co., W. D., Boston, Mass.
Central Brass Mfg. Co., Cleveland, O.
● Crane Co., Chicago, Ill.
Cuno Engineering Corp., Meriden, Conn.
Davis Regulator Co., Chicago, Ill.
Edward Valve & Mfg. Co., Inc., East Chicago, Ind.
Elliott Co., Jeannette, Pa.
● Fisher Governor Co., Marshalltown, Ia.
Flagg & Co., Inc., Stanley G., Philadelphia, Pa.
Foster Engineering Co., Newark, N. J.
Foster Pump Works, Inc., Brooklyn, N. Y.
● General Controls Co., Glendale, Calif.
Golden-Anderson Valve Specialty Co., Pittsburgh, Pa.
● Hoffman Specialty Co., Indianapolis, Ind.
● Illinois Engineering Co., Chicago, Ill.
Imperial Brass Mfg. Co., Chicago, Ill.
Kaye & MacDonald, Inc., West Orange, N. J.
Keckley Co., O. C., Chicago, Ill.
Kerotest Mfg. Co., Pittsburgh, Pa.
● Kieley & Mueller, Inc., North Bergen, N. J.
Kinney Mfg. Co., Boston, Mass.
Kraissl Co., Inc., The, Hackensack, N. J.
Leslie Co., Lyndhurst, N. J.
● Maid-O'-Mist, Inc., Chicago, Ill.
Mason-Neilan Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Monarch Mfg. Wks., Inc., Philadelphia, Pa.
Mueller Brass Co., Port Huron, Mich.
Mueller Co., Decatur, Ill.
Mueller Steam Specialty Co., Long Island City, N. Y.
Newark Wire Cloth Co., Newark, N. J.
Nicholson & Co., W. H., Wilkes-Barre, Pa.
Phillips & Co., H. A., Chicago, Ill.
Preferred Utilities Co., Inc., New York, N. Y.
● Reading-Pratt & Cady Div., American Chain & Cable Co., Inc., Reading, Pa.
Rosedale Foundry & Machine Co., Pittsburgh, Pa.
Ruggles-Klingemann Mfg. Co., Salem, Mass.
● Sarco Co., New York, N. Y.
● Sarcotherm Controls, Inc., Chicago, Ill.
Schade Valve Mfg. Co., Philadelphia, Pa.
Schutte & Koerting Co., Philadelpia, Pa.
Scientific Instrument Co., Detroit, Mich.
Sheffler-Gross Co., Philadelphia, Pa.
Spence Engineering Co., Walden, N. Y.
Spray Engineering Co., Somerville, Mass.
● Spraying Systems Co., Chicago, Ill.
Staples & Pfeiffer, Ltd., San Francisco, Calif.
● Sterling, Inc., Milwaukee, Wis.
Straight Line Foundry & Machine Corp., Direct Separator Div., The, Syracuse, N. Y.
Strong, Carlisle & Hammond Co., Cleveland, O.
Swartwout Co., Cleveland, O.
● Trane Co, The, La Crosse, Wis.
Trerice Co., H. O., Detroit, Mich.
Trimount Rotary Power Co., East Dedham, Mass.
Tryco Products, Inc., Westfield, Mass.
Wade Mfg. Co., Div. of Woodruff & Edwards, Inc., Elgin, Ill.
Watson & McDaniel Co., Philadelphia, Pa.
Watts Regulator Co., Lawrence, Mass.
● Webster & Co., Warren, Camden, N. J.
Wright-Austin Co., Detroit, Mich.
● Yarnall-Waring Co., Philadelphia, Pa.
Zallea Brothers & Johnson, Wilmington, Del.

STRESS RELIEVERS

See Preheaters and Stress Relievers, Electric, for Pipe Welds

STRIP HEATERS

See Heaters, Strip and Immersion, Electric

STRUCTURAL SHAPES

See Angles, Bars, Beams, Channels and Tees

SUCTION LINE HEAT EXCHANGERS

See Exchangers, Heat

SUMP PUMPS

See Pumps, Sump

SUPERHEATERS, PROCESS STEAM

● Bell & Gossett Co., Morton Grove, Ill.
Edge Moor Iron Works, Inc., New York, N. Y.
Foster Wheeler Corp., New York, N. Y.
Mears-Kane-Ofeldt, Inc., Philadelphia, Pa.
Selas Co., The, Philadelphia, Pa.

● Advertisement in this issue. See Index to Advertisers, page 322.

SURFACE, FINNED, COOLING, BRINE

- Acme Industries, Inc., Jackson, Mich.
- Aerofin Corp., Syracuse, N. Y.
- American Coils, Inc., Newark, N. J.
- Beacon-Morris Corp., Boston, Mass.
- Betz Corp., Hammond, Ind.
- Bohn Aluminum & Brass Corp., Detroit, Mich.
- ● Bush Mfg. Co., Hartford, Conn.
- Conditionaire Unit Co., Chicago, Ill.
- Drayer & Hanson, Inc., Los Angeles, Calif.
- ● G. & O. Mfg. Co., New Haven, Conn.
- General Refrigeration Div., Yates-American Machine Co., Beloit, Wis.
- Griscom-Russell Co., The, New York, N. Y.
- Industrial Mfg. & Engineering Co., Chicago, Ill.
- ● Kramer Trenton Co., Trenton, N. J.
- ● Marlo Coil Co., St. Louis, Mo.
- ● McCord Radiator & Mfg. Co., Detroit, Mich.
- McQuay, Inc., Minneapolis, Minn.
- ● Murray Mfg. Co., D. J., Wausau, Wis.
- Niagara Blower Co., New York, N. Y.
- Peerless of America, Inc., Chicago, Ill.
- Refrigeration Appliances, Inc., Chicago, Ill.
- Refrigeration Economics Co., Inc., Canton, O.
- Rempe Co., Chicago, Ill.
- Roessing Mfg. Co., Pittsburgh, Pa.
- Rome-Turney Radiator Co., Rome, N. Y.
- Sturtevant Co., B. F., Hyde Park, Boston, Mass.
- Super Radiator Corp., Minneapolis, Minn.
- ● Trane Co., The, La Crosse, Wis.
- Vilter Mfg. Co., Milwaukee, Wis.
- Wolverine Tube Div. of Calumet and Hecla Consolidated Copper Co., Detroit, Mich.
- X L Refrigerating Co., Chicago, Ill.
- York Corp., York, Pa.
- ● Young Radiator Co., Racine, Wis.

SURFACE, FINNED, COOLING, COLD WATER

- Acme Industries, Inc., Jackson, Mich.
- Aerofin Corp., Syracuse, N. Y.
- ● Airtemp, Div. of Chrysler Corp., Dayton, O.
- American Coils, Inc., Newark, N. J.
- Beacon-Morris Corp., Boston, Mass.
- Betz Corp., Hammond, Ind.
- Bohn Aluminum & Brass Corp., Detroit, Mich.
- ● Bush Mfg. Co., Hartford, Conn.
- Campbell Heating Co., E. K., Kansas City, Mo.
- Conditionaire Unit Co., Chicago, Ill.
- Drayer & Hanson, Inc., Los Angeles, Calif.
- ● Fedders Mfg. Co., Inc., Buffalo, N. Y.
- Frigidaire Div., General Motors Corp., Dayton, O.
- ● G. & O. Mfg. Co., New Haven, Conn.
- General Electric Co., Air Conditioning and Commercial Refrigeration Divisions, Bloomfield, N. J.
- General Refrigeration Div., Yates-American Machine Co., Beloit, Wis.
- Griscom-Russell Co., The, New York, N. Y.
- Industrial Mfg. & Engineering Co., Chicago, Ill.
- ● Johnson Fan & Blower Corp., Chicago, Ill.
- Kauffman Air Conditioning Corp., St. Louis, Mo.
- ● Kennard, Inc., Sam, St. Louis, Mo.
- ● Kramer Trenton Co., Trenton, N. J.
- Larkin Coils, Inc., Atlanta, Ga.
- Manufacturers Fin Coil Co., Chicago, Ill.
- ● Marlo Coil Co., St. Louis, Mo.
- ● McCord Radiator & Mfg. Co., Detroit, Mich.
- McQuay, Inc., Minneapolis, Minn.
- ● Modine Mfg. Co., Racine, Wis.
- Mojonnier Bros. Co., Chicago, Ill.
- ● Murray Mfg. Co., D. J., Wausau, Wis.
- ● Nesbitt, Inc., John J., Philadelphia, Pa.
- Niagara Blower Co., New York, N. Y.
- Palmer Mfg. Corp., Phoenix, Ariz.
- Peerless of America, Inc., Chicago, Ill.
- Refrigeration Appliances, Inc., Chicago, Ill.
- Refrigeration Economics Co., Inc., Canton, O.
- Rempe Co., Chicago, Ill.
- Roessing Mfg. Co., Pittsburgh, Pa.
- Rome-Turney Radiator Co., Rome, N. Y.
- Standard Galvanizing Co., Chicago, Ill.
- Sturtevant Co., B. F., Hyde Park, Boston, Mass.
- Super Radiator Corp., Minneapolis, Minn.
- ● Tilco-Fin Inc., Brooklyn, N. Y.
- ● Trane Co., The, La Crosse, Wis.
- Vilter Mfg. Co., Milwaukee, Wis.
- Westinghouse Electric & Mfg. Co., Springfield, Mass.
- ● Wing Mfg. Co., L. J., New York, N. Y.
- Wolverine Tube Div. of Calumet and Hecla Consolidated Copper Co., Detroit, Mich.
- X L Refrigerating Co., Chicago, Ill.
- Yates-American Machine Co., Beloit, Wis.
- York Corp., York, Pa.
- ● Young Radiator Co., Racine, Wis.

SURFACE, FINNED, COOLING, DIRECT EXPANSION

- Acme Industries, Inc., Jackson, Mich.
- Aerofin Corp., Syracuse, N. Y.
- ● Airtemp, Div. of Chrysler Corp., Dayton, O.
- American Coils, Inc., Newark, N. J.
- Beacon-Morris Corp., Boston, Mass.
- Betz Corp., Hammond, Ind.
- Bohn Aluminum & Brass Corp., Detroit, Mich.
- ● Bush Mfg. Co., Hartford, Conn.
- Conditionaire Unit Co., Chicago, Ill.
- Drayer & Hanson, Inc., Los Angeles, Calif.
- ● Fedders Mfg. Co., Inc., Buffalo, N. Y.
- Frigidaire Div., General Motors Corp., Dayton, O.
- ● G. & O. Mfg. Co., New Haven, Conn.
- General Electric Co., Air Conditioning and Commercial Refrigeration Divisions, Bloomfield, N. J.
- General Refrigeration Div., Yates-American Machine Co., Beloit, Wis.
- Griscom-Russell Co., The, New York, N. Y.
- Kauffman Air Conditioning Corp., St. Louis, Mo.
- ● Kennard, Inc., Sam, St. Louis, Mo.
- ● Kramer Trenton Co., Trenton, N. J.
- Larkin Coils, Inc., Atlanta, Ga.
- Manufacturers Fin Coil Co., Chicago, Ill.
- ● Marlo Coil Co., St. Louis, Mo.
- ● McCord Radiator & Mfg. Co., Detroit, Mich.
- McQuay, Inc., Minneapolis, Minn.
- Mojonnier Bros. Co., Chicago, Ill.
- ● Murray Mfg. Co., D. J., Wausau, Wis.
- Niagara Blower Co., New York, N. Y.
- Peerless of America, Inc., Chicago, Ill.
- Refrigeration Appliances, Inc., Chicago, Ill.
- Refrigeration Economics Co., Inc., Canton, O.
- Rempe Co., Chicago, Ill.
- Roessing Mfg. Co., Pittsburgh, Pa.
- Rome-Turney Radiator Co., Rome, N. Y.
- Standard Galvanizing Co., Chicago, Ill.
- Sturtevant Co., B. F., Hyde Park, Boston, Mass.
- Super Radiator Corp., Minneapolis, Minn.
- ● Tilco-Fin Inc., Brooklyn, N. Y.
- ● Trane Co., The, La Crosse, Wis.
- Vilter Mfg. Co., Milwaukee, Wis.
- Westinghouse Electric & Mfg. Co., Springfield, Mass.
- Wolverine Tube Div. of Calumet and Hecla Consolidated Copper Co., Detroit, Mich.
- X L Refrigerating Co., Chicago, Ill.
- Yates-American Machine Co., Beloit, Wis.
- York Corp., York, Pa.
- ● Young Radiator Co., Racine, Wis.

SURFACE, FINNED, HEATING, INDIRECT, FERROUS

- ● Airtherm Mfg. Co., St. Louis, Mo.
- American Radiator & Standard Sanitary Corp., Pittsburgh, Pa.
- Bayley Blower Co., Milwaukee, Wis.
- Campbell Heating Co., E. K., Kansas City, Mo.
- Conditionaire Unit Co., Chicago, Ill.
- Drayer & Hanson, Inc., Los Angeles, Calif.
- ● Fedders Mfg. Co., Inc., Buffalo, N. Y.
- ● G. & O. Mfg. Co., New Haven, Conn.
- General Electric Co., Air Conditioning and Commercial Refrigeration Divisions, Bloomfield, N. J.
- Griscom-Russell Co., The, New York, N. Y.
- Industrial Mfg. & Engineering Co., Chicago, Ill.
- ● Kennard, Inc., Sam, St. Louis, Mo.
- ● Modine Mfg. Co., Racine, Wis.
- ● Murray Mfg. Co., D. J., Wausau, Wis.
- ● Nesbitt, Inc., John J., Philadelphia, Pa.
- New York Blower Co., Chicago, Ill.
- Niagara Blower Co., New York, N. Y.
- Refrigeration Appliances, Inc., Chicago, Ill.
- Refrigeration Economics Co., Inc., Canton, O.
- Sturtevant Co., B. F., Hyde Park, Boston, Mass.
- ● Trane Co., The, La Crosse, Wis.
- Westinghouse Electric & Mfg. Co., Springfield, Mass.
- Wolff & Munier, Inc., New York, N. Y. (For panel heating)

SURFACE, FINNED, HEATING, INDIRECT, NON-FERROUS

- Aerofin Corp., Syracuse, N. Y.
- ● Airtherm Mfg. Co., St. Louis, Mo.
- American Coils, Inc., Newark, N. J.
- Bayley Blower Co., Milwaukee, Wis.
- Beacon-Morris Corp., Boston, Mass.
- Bohn Aluminum & Brass Corp., Detroit, Mich.
- ● Bush Mfg. Co., Hartford, Conn.
- Campbell Heating Co., E. K., Kansas City, Mo.
- Drayer & Hanson, Inc., Los Angeles, Calif.
- ● Fedders Mfg. Co., Inc., Buffalo, N. Y.
- Frigidaire Div., General Motors Corp., Dayton, O.
- ● G. & O. Mfg. Co., New Haven, Conn.
- General Electric Co., Air Conditioning and Commercial Refrigeration Divisions, Bloomfield, N. J.
- Griscom-Russell Co., The, New York, N. Y.
- Industrial Mfg. & Engineering Co., Chicago, Ill.
- ● Johnson Fan & Blower Corp., Chicago, Ill.
- Kauffman Air Conditioning Corp., St. Louis, Mo.
- ● Kennard, Inc., Sam, St. Louis, Mo.
- ● Kramer Trenton Co., Trenton, N. J.
- Manufacturers Fin Coil Co., Chicago, Ill.
- ● Marlo Coil Co., St. Louis, Mo.
- ● McCord Radiator & Mfg. Co., Detroit, Mich.
- McQuay, Inc., Minneapolis, Minn.
- ● Modine Mfg. Co., Racine, Wis.
- ● Murray Mfg. Co., D. J., Wausau, Wis.

● Advertisement in this issue. See Index to Advertisers, page 322.

• Nesbitt, Inc., John J., Philadelphia, Pa.
Niagara Blower Co., New York, N. Y.
Peerless of America, Inc., Chicago, Ill.
Refrigeration Economics Co., Inc., Canton, O.
Rempe Co., Chicago, Ill.
Rome-Turney Radiator Co., Rome, N. Y.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Super Radiator Corp., Minneapolis, Minn.
• Tilco-Fin, Inc., Brooklyn, N. Y.
• Trane Co., The, La Crosse, Wis.
• Wing Mfg. Co., L. J., New York, N. Y.
Wolverine Tube Div. of Calumet and Hecla Consolidated Copper Co., Detroit, Mich.
York Corp., York, Pa.
• Young Radiator Co., Racine, Wis.

SURFACE THERMOSTATS

See Thermostats, Surface

SWING JOINTS

See Joints, Pipe, Flexible Swing and Revolving

SWITCHES, ELECTRICAL

Adam Electric Co., Frank, St. Louis, Mo.
Allen-Bradley Co., Milwaukee, Wis.
• Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Arrow-Hart & Hegeman Elect. Co., Hartford, Conn.
Automatic Switch Co., New York, N. Y.
• Barber-Colman Co., Rockford, Ill.
Clark Controller Co., Cleveland, O.
Consolidated Car-Heating Co., Inc., Albany, N. Y.
Cooper Co., Clark, Palmyra, N. J.
Cutler-Hammer, Inc., Milwaukee, Wis.
Delta-Star Electric Co., Chicago, Ill.
Dunn, Inc., Struthers, Philadelphia, Pa.
Electric Controller & Mfg. Co., Cleveland, O.
Electric Machinery Mfg. Co., Minneapolis, Minn.
• General Controls Co., Glendale, Calif.
General Electric Co., Schenectady, N. Y.
Guardian Electric Mfg. Co., Chicago, Ill.
Hart Mfg. Co., Hartford, Conn.
Marsh Corp., Jas. P., Chicago, Ill.
Martens & Stormoen, Boston, Mass.
• McDonnell & Miller, Chicago, Ill.
• Mercoid Corp., Chicago, Ill.
Micro Switch Corp., Freeport, Ill.
• Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
Monitor Controller Co., The, Baltimore, Md.
• Penn Electric Switch Co., Goshen, Ind.
Perfex Corp., Milwaukee, Wis.
Square D Co., Detroit, Mich.
Square D Co., Industrial Controller Div., Milwaukee, Wis.
Struthers Dunn, Inc., Philadelphia, Pa.
Tork Clock Co., Inc., Mount Vernon, N. Y.
Trumbull Electric Mfg. Co., Plainville, Conn.
Ward Leonard Electric Co., Mount Vernon, N. Y.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
White Mfg. Co., St. Paul, Minn.
Zenith Electric Co., Chicago, Ill.

SWITCHES, FLOAT, REFRIGERATION

• Alco Valve Co., St. Louis, Mo.
Clark Controller Co., Cleveland, O.
Frick Co., Waynesboro, Pa.
• McDonnell & Miller, Chicago, Ill.
• Mercoid Corp., The, Chicago, Ill.
Schaub Engineering Co., Fred H., Chicago, Ill.
Ward Leonard Electric Co., Mt. Vernon, N. Y.

SWITCHES, FLOW

• General Controls Co., Glendale, Calif.
• McDonnell & Miller, Chicago, Ill.

SWITCHES, LIQUID LEVEL

• Alco Valve Co., St. Louis, Mo.
Allen-Bradley Co., Milwaukee, Wis.
Arrow-Hart & Hegeman Elect. Co., Hartford, Conn.
Automatic Control Co., St. Paul, Minn.
B/W Controller Corp., Birmingham, Mich.
Bennett Oil Co., Omaha, Neb.
Cissell Mfg. Co., W. M., Louisville, Ky.
Cooper Co., Clark, Palmyra, N. J.
Cutler-Hammer, Inc., Milwaukee, Wis.
• Detroit Lubricator Co., Detroit, Mich.
• General Controls Co., Glendale, Calif.
General Electric Co., Schenectady, N. Y.
Healy Ruff Co., St. Paul, Minn.
Kisco Boiler & Engineering Co., St. Louis, Mo.
McAlear Mfg. Co., Chicago, Ill.
• McDonnell & Miller, Chicago, Ill.
• Mercoid Corp., Chicago, Ill.
• Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
Monitor Controller Co., The, Baltimore, Md.
• Penn Electric Switch Co., Goshen, Ind.
Photoswitch, Inc., Cambridge, Mass.
Ruggles-Klingemann Mfg. Co., Salem, Mass.
Schaub Engineering Co., Fred H., Chicago, Ill.
Square D Co., Detroit, Mich.
Square D Co., Industrial Controller Div., Milwaukee, Wis.
• Stephens-Adamson Mfg. Co., Aurora, Ill.
Trumbull Electric Mfg. Co., Plainville, Conn.
Ward Leonard Electric Co., Mt. Vernon, N. Y.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

SWITCHES, MERCURY

Automatic Temperature Control Co., Inc., Philadelphia, Pa.
Brown Instrument Co., Div. of Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.
Durakool, Inc., Elkhart, Ind.
General Electric Co., Lamp Dept., Nela Park, Cleveland, O.
Hart Mfg. Co., Hartford, Conn.
Jefferson Electric Co., Bellwood, Ill.
• Mercoid Corp., Chicago, Ill.
• Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.

SWITCHES, PRESSURE AND VACUUM

Allen-Bradley Co., Milwaukee, Wis.
Au-Temp-Co Corp., New York, N. Y.
• Barber-Colman Co., Rockford, Ill.
Clark Controller Co., Cleveland, O.
Cooper Co., Clark, Palmyra, N. J.
Cutler-Hammer, Inc., Milwaukee, Wis.
• Detroit Lubricator Co., Detroit, Mich.
Friez Instrument Div., Bendix Aviation Corp., Towson, Md.
General Electric Co., Schenectady, N. Y.
Gleason-Avery, Inc., Auburn, N. Y.
Healy Ruff Co., St. Paul, Minn.
Marsh Corp., Jas. P., Chicago, Ill.
• Mercoid Corp., Chicago, Ill.
• Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
Monitor Controller Co., The, Baltimore, Md.
• Penn Electric Switch Co., Goshen, Ind.
Perfex Corp., Milwaukee, Wis.
Pioneer Heat Regulator Div., Master Electric Co., The, Dayton, O.
Sampsel Time Control, Inc., Spring Valley, Ill.
Spencer Thermostat Co., Attleboro, Mass.
Square D Co., Detroit, Mich.
Square D Co., Industrial Controller Div., Milwaukee, Wis.
Tomlee Tool & Engineering Co., Minneapolis, Minn.
Uniflow Mfg. Co., Erie, Pa.
Vapor Car Heating Co., Inc., Chicago, Ill.
Ward Leonard Electric Co., Mt. Vernon, N. Y.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
• White-Rodgers Electric Co., St. Louis, Mo.

SWITCHES, TIME

Allen-Bradley Co., Milwaukee, Wis.
Au-Temp-Co Corp., New York, N. Y.
Automatic Temperature Control Co., Inc., Philadelphia, Pa.
• Barber-Colman Co., Rockford, Ill.
Cooper Co., Clark, Palmyra, N. J.
Cramer Co., Inc., R. W., The, Centerbrook, Conn.
• Detroit Lubricator Co., Detroit, Mich.
• Edison, Inc., Thomas A., Instrument Div., West Orange, N. J.
• General Controls Co., Glendale, Calif.
General Electric Co., Schenectady, N. Y.
Gleason-Avery, Inc., Auburn, N. Y.
• Hansen Mfg. Co., Inc., Princeton, Ind.
Healy Ruff Co., St. Paul, Minn.
Industrial Engineering Corp., Terre Haute, Ind.
International Register Co., Chicago, Ill.
• Mercoid Corp., Chicago, Ill.
• Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
National Time & Signal Corp., Detroit, Mich.
Paragon Electric Co., Chicago, Ill.
• Penn Electric Switch Co., Goshen, Ind.
Perfex Corp., Milwaukee, Wis.
Photoswitch, Inc., Cambridge, Mass.
Reliance Automatic Lighting Co., Racine, Wis.
Rhodes, Inc., M. H., Hartford, Conn.
Sampsel Time Control, Inc., Spring Valley, Ill.
Sangamo Electric Co., Springfield, Ill.
Spencer Thermostat Co., Attleboro, Mass.
Tork Clock Co., Inc., Mount Vernon, N. Y.
Ward Leonard Electric Co., Mt. Vernon, N. Y.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
• White-Rodgers Electric Co., St. Louis, Mo.
Zenith Electric Co., Chicago, Ill.

SYSTEMS, COMBUSTION CONTROL

Askania Regulator Co., Chicago, Ill.
Bailey Meter Co., Cleveland, O.
Bowser, Inc., Fort Wayne, Ind.
Bristol Co., Waterbury, Conn.
Brooke Engineering Co., Inc., Philadelphia, Pa.
Brown Instrument Co., Div. of Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.
• Cash Co., A. W., Decatur, Ill.
Engineer Co., New York, N. Y.
Hagan Corp., Pittsburgh, Pa.
• Hays Corp., Michigan City, Ind.
• Hotstream Heater Co., Cleveland, O.
• Illinois Engineering Co., Chicago, Ill.
• Leeds & Northrup Co., Philadelphia, Pa.

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Mason-Neilan Regulator Co., Boston, Mass.
● Mercoid Corp., Chicago, Ill.
National Brass Co., Grand Rapids, Mich.
Republic Flow Meters Co., Chicago, Ill.
Ruggles-Klingemann Mfg. Co., Salem, Mass.
Selas Co., The, Philadelphia, Pa.
Shallcross Controls, Inc., Milwaukee, Wis.
Wheelco Instruments Co., Chicago, Ill.
● Wing Mfg. Co., L. J., New York, N. Y.

SYSTEMS, HEATING, HOT WATER

● Barber-Colman Co., Rockford, Ill.
● Bell & Gossett Co., Morton Grove, Ill.
Cash Valve Mfg. Co., A. W., Decatur, Ill.
General Fittings Co., Providence, R. I.
● Hoffman Specialty Co., Indianapolis, Ind.
Kainer & Co., Chicago, Ill.
Kehm Corp., The, Chicago, Ill.
Lawler Automatic Controls, Mount Vernon, N. Y.
● Maid-O'-Mist, Inc., Chicago, Ill.
Penberthy Injector Co., Detroit, Mich.
Preferred Utilities Co., Inc., New York, N. Y.
● Sarcotherm Controls, Inc., Chicago, Ill.
Sullivan Valve & Engineering Co., Butte, Mont.
Taco Heaters, Inc., New York, N. Y.
● Thrush & Co., H. A., Peru, Ind.
● Trane Co., The, La Crosse, Wis.
Triplex Heating Specialty Co., Peru, Ind.
Watts Regulator Co., Lawrence, Mass.

SYSTEMS, HEATING, VACUUM

All-Vac Steam Control System, Chicago, Ill.
Anderson Products, Inc., Cambridge, Mass.
Barnes & Jones, Inc., Jamaica Plain, Boston, Mass.
Cashin, W. D., Boston, Mass.
● Dunham Co., C. A., Chicago, Ill.
● Hoffman Specialty Co., Indianapolis, Ind.
● Illinois Engineering Co., Chicago, Ill.
Lonn Mfg. Co., Inc., Chicago, Ill.
Marsh Corp., Jas. P., Chicago, Ill.
Monash-Younker Co., Chicago, Ill.
Mouat Vapor Heating Co., The, Cleveland, O.
● Sarco Co., Inc., New York, N. Y.
● Sarcotherm Controls, Inc., Chicago, Ill.
● Sterling, Inc., Milwaukee, Wis.
Stickle Steam Specialties Co., Indianapolis, Ind.
● Trane Co., The, La Crosse, Wis.
● Webster & Co., Warren, Camden, N. J.

SYSTEMS, HEATING, VAPOR

All-Vac Steam Control System, Chicago, Ill.
● American District Steam Co., North Tonawanda, N. Y.
Au-Temp-Co Corp., New York, N. Y.
Barnes & Jones, Inc., Jamaica Plain, Boston, Mass.
● Dunham Co., C. A., Chicago, Ill.
Gorton Heating Corp., Cranford, N. J.
● Hoffman Specialty Co., Indianapolis, Ind.
● Illinois Engineering Co., Chicago, Ill.
Monash-Younker Co., Chicago, Ill.
Mouat Vapor Heating Co., The, Cleveland, O.
● Sarco Co., Inc., New York, N. Y.
● Sarcotherm Controls, Inc., Chicago, Ill.
● Sterling, Inc., Milwaukee, Wis.
● Trane Co., The, La Crosse, Wis.
Vapor Specialty Co., New York, N. Y.
● Webster & Co., Warren, Camden, N. J.

SYSTEMS, HEATING, ZONE CONTROL

Armstrong Heat Control Co., Portland, Ore.
Au-Temp-Co Corp., New York, N. Y.
Automatic Temperature Control Co., Inc., Philadelphia, Pa.
● Barber-Colman Co., Rockford, Ill.
Barnes & Jones, Inc., Jamaica Plain, Boston, Mass.
● Bell & Gossett Co., Morton Grove, Ill.
Cook Electric Co., Chicago, Ill.
● Dunham Co., C. A., Chicago, Ill.
● Illinois Engineering Co., Chicago, Ill.
● Johnson Service Co., Milwaukee, Wis.
Major Controls Sales Div., Cambridge, Mass.
Marsh Tritrol Co., Chicago, Ill.
● Mercoid Corp., Chicago, Ill.
● Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
● Sarco Co., Inc., New York, N. Y.
● Sarcotherm Controls, Inc., Chicago, Ill.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Spence Engineering Co., Inc., Walden, N. Y.
Tallmadge & Co., Webster, East Orange, N. J.
● Thrush & Co., H. A., Peru, Ind.
● Webster & Co., Warren, Camden, N. J.
Webster Tallmadge & Co., East Orange, N. J.

SYSTEMS, PROCESS HEATING, HIGH TEMPERATURE

● Air Devices, Inc., New York, N. Y.
All-Vac Steam Control System, Chicago, Ill.
Automatic Temperature Control Co., Inc., Philadelphia, Pa.
● Dow Chemical Co., Midland, Mich.
Foster Wheeler Corp., New York, N. Y.
● Illinois Engineering Co., Chicago, Ill.
Lee Engineering Co., Youngstown, O.
Parks-Cramer Co., Fitchburg, Mass.
Ross Engineering Corp., J. O., New York, N. Y.
● Sarcotherm Controls, Inc., Chicago, Ill.
Selas Co., The, Philadelphia, Pa.
● Skinner Heating & Ventilating Co., Inc., Div. of St. Louis Blow Pipe & Heater Co., St. Louis, Mo.
Trent Co., Harold E., Philadelphia, Pa.
Williams, Inc., F. C., Dearborn, Mich.
● Wing Mfg. Co., L. J., New York, N. Y

SYSTEMS, ROOF SPRAYING (FOR COOLING ROOFS)

April Showers Co., Washington, D. C.
Rockwood Sprinkler Co., Worcester, Mass.
Ross Sprinkler Co., Pasadena, Calif.
Ruppright, Siegfried, Bell, Calif.
Schubert-Christy Corp., Indio, Calif.
Spray Engineering Co., Somerville, Mass.
● Spraying Systems Co., Chicago, Ill.
Water Cooling Corp., New York, N. Y.

SYSTEMS, SPRINKLER, FOR AIR CONDITIONING DUCT SYSTEMS

Rockwood Sprinkler Co., Worcester, Mass.

TANK HEADS

See Parts, for Heating and Air Conditioning Equipment

TANKS, EXPANSION, FOR HOT WATER HEATING SYSTEMS

● Bell & Gossett Co., Morton Grove, Ill.
Buffalo Tank Corp., Dunellen, N. J.
Case & Son Mfg. Co., W. A., Buffalo, N. Y.
Kehm Corp., The, Chicago, Ill.
Kopperman & Sons, Joseph, Philadelphia, Pa.
Koven & Bro., Inc., L. O., Jersey City, N. J.
Maysteel Products, Inc., Mayville, Wis.
Stainless & Steel Products Co., St. Paul, Minn.
● Thrush & Co., H. A., Peru, Ind.
● Trane Co., The, La Crosse, Wis.
Triplex Heating Specialty Co., Peru, Ind.
Western Blower Co., Seattle, Wash.

TANKS, PROCESS AND STORAGE

Aluminum Co. of America, Pittsburgh, Pa.
American Hard Rubber Co., New York, N. Y.
Ames Iron Works, Div. of Pierce Butler Radiator Corp, Oswego, N. Y.
● Bell & Gossett Co., Morton Grove, Ill.
Bigelow Co., New Haven, Conn.
Biggs Boiler Wks. Co., E. Akron, O.
Black-Sivalls & Bryson, Inc., Kansas City, Mo.
Bros Boiler & Mfg. Co., Wm., Minneapolis, Minn.
Brownell Co., Dayton, O.
Buffalo Tank Corp., Dunellen, N. J.
Caldwell Co., W. E., Louisville, Ky.
Case & Son Mfg. Co., W. A., Buffalo, N. Y.
Chicago Bridge & Iron Co., Chicago, Ill.
Chicago Steel Tank Co., Chicago, Ill.
Columbian Steel Tank Co., Kansas City, Mo.
Connery Construction Co., Philadelphia, Pa.
Continental Diamond Fibre Co., Newark, Del.
Dahlquist Mfg. Co., Inc., Somerville, Mass.
Day Co., The, Minneapolis, Minn.
Devine Mfg. Co., Inc., J. P., Mt. Vernon, Ill.
Dillon Steam Boiler Wks., Inc., D. M., Fitchburg, Mass.
Downingtown Iron Works, Downingtown, Pa.
Eclipse Fuel Engineering Co., Rockford, Ill.
Falstrom Co., Passaic, N. J.
Farquhar Co., Ltd., A. B., York, Pa.
Farrar & Trefts, Buffalo, N. Y.
● Filtrine Mfg. Co., Inc., Brooklyn, N. Y.
Frank Heaters, Inc., Paterson, N. J.
Frick Co., Waynesboro, Pa.
Gerstein & Cooper Co., South Boston, Mass.
Goodrich Co., B. F., Akron, O. (Rubber lined)
Grand Rapids Blow Pipe & Dust Arrester Co., Grand Rapids, Mich.
Graver Tank & Mfg. Co., Inc., East Chicago, Ind.
Hamburg Boiler Wks., Inc., Hamburg, Pa.
Harris & Co., Arthur, Chicago, Ill.
Illinois Oil Co., Rock Island, Ill.
International Boiler Wks. Co., East Stroudsburg, Pa.
International Engineering Wks., Framingham, Mass.
● Kewanee Boiler Corp., Kewanee, Ill.
Kirk & Blum Mfg. Co., Cincinnati, O.
Knight, Maurice A., Akron, O.
Kopperman & Sons, Joseph, Philadelphia, Pa.
Koven & Bro., Inc., L. O., Jersey City, N. J.
La Crosse Tractor Co., La Crosse, Wis.
Lead Lined Iron Pipe Co., Wakefield, Mass.
Littleford Bros., Cincinnati, O.
Manitowoc Boiler Wks., Manitowoc, Wis.
Mauck Seamless Copper Tank Co., Victor, Norristown, Pa.
Maysteel Products, Inc., Mayville, Wis.
Mojonnier Brothers Co., Chicago, Ill.

● Advertisement in this issue. See Index to Advertisers, page 322.

Murray Iron Wks. Co., Burlington, Ia.
National Lead Co., New York, N. Y.
National Radiator Co., The, Johnstown, Pa.
● Patterson-Kelley Co., Inc., East Stroudsburg, Pa.
Quaker City Iron Wks., Philadelphia, Pa.
Richmond Engineering Co., Inc., Richmond, Va.
Roessing Mfg. Co., Pittsburgh, Pa.
Rosebraugh Co., W. W., Salem, Ore.
Scaife Co., Oakmont, Pa.
Sims Co., Erie, Pa.
Southbridge Roofing Co., Inc., Southbridge, Mass.
Stainless & Steel Products Co., St. Paul, Minn.
Steinhorst & Sons, Inc., Emil, Utica, N. Y.
Strandwitz & Co., Inc., W. J., Camden, N. J.
Struthers Wells Corp., Titusville, Pa.
Tippett & Wood, Phillipsburg, N. J.
Trageser Copper Wks., Inc., Maspeth, Long Island, N. Y.
Uniflow Mfg. Co., Erie, Pa.
United States Rubber Co., New York, N. Y.
United States Stoneware Co., New York, N. Y.
Vesco Corp., New York, N. Y.
Walsh-Holyoke Steam Boiler Co., Holyoke, Mass.
Waterfilm Boilers, Inc., Jersey City, N. J.
Wheeling Steel Corp., Wheeling, W. Va. (Heater)
● Whitlock Mfg. Co., Hartford, Conn.
Zallea Brothers & Johnson, Wilmington, Del.

TANKS, WASH, FOR CASTINGS

● Bell & Gossett Co., Morton Grove, Ill.
Eclipse Fuel Engineering Co., Rockford, Ill.

TEMPERATURE AND HUMIDITY CONTROLS

See Humidistats; Recorder-Controllers; Thermostats

TEMPERATURE RECORDERS

See Recorders, Temperature

TEMPERATURE REGULATORS

See Regulators, Temperature

TESTERS, GAGE, DEAD WEIGHT

● Ashton Valve Co., Cambridge, Mass.

THERMOMETERS, INDICATING, INDUSTRIAL

American Schaeffer & Budenberg Instrument Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn.
American Thermometer Co., St. Louis, Mo.
Brown Instrument Co., Div. of Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.
Electric Auto-Lite Co., Moto Meter Gauge & Equipment Div., La Crosse, Wis.
Foxboro Co., Foxboro, Mass.
G. M. Mfg. Co., New York, N. Y.
H-B Instrument Co., Philadelphia, Pa.
● Hays Corp., Michigan City, Ind.
Hill, E. Vernon, Chicago, Ill.
● Illinois Testing Laboratories, Inc., Chicago, Ill.
● Johnson Service Co., Milwaukee, Wis.
● Leeds & Northrup Co., Philadelphia, Pa.
Marsh Corp., Jas. P., Chicago, Ill.
● Martocello & Co., Jos. A., Philadelphia, Pa.
Mason-Neilan Regulator Co., Boston, Mass.
Moeller Instrument Co., Richmond Hill, N. Y.
Palmer Co., Cincinnati (Norwood), O.
Philadelphia Thermometer Co., Philadelphia, Pa.
Pierce Butler Radiator Corp., Syracuse, N. Y.
● Powers Regulator Co., Chicago, Ill.
Precision Thermometer & Instrument Co., Philadelphia, Pa.
Preferred Utilities Co., Inc., New York, N. Y.
Pyrometer Instrument Co., New York, N. Y.
Rochester Mfg. Co., Rochester, N. Y.
Scientific Instrument Co., Detroit, Mich.
Standard Thermometer, Inc., Boston, Mass.
Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
Taylor Instrument Companies, Rochester, N. Y.
Tempil Corp., New York, N. Y. (Thermometric devices for determination of temperature in industry)
Trerice Co., H. O., Detroit, Mich.
● United States Gauge Co., New York, N. Y.
Weksler Thermometer Corp., New York, N. Y.
Weston Electrical Instrument Corp., Newark, N. J.
Wheelco Instruments Co., Chicago, Ill.

THERMOMETERS, INDICATING, REMOTE-READING

American Schaeffer & Budenberg Instrument Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn.
Bristol Co., Waterbury, Conn.
Brown Instrument Co., Div. of Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.
Electric Auto-Lite Co., Moto Meter Gauge & Equipment Div., La Crosse, Wis.
Engelhard, Inc., Charles, Newark, N. J.
Fee & Stemwedel, Inc., Chicago, Ill.
Foxboro Co., Foxboro, Mass.
G. M. Mfg. Co., New York, N. Y.
H-B Instrument Co., Philadelphia, Pa.
● Hays Corp., Michigan City, Ind.
● Hotstream Heater Co., Cleveland, O.
● Illinois Testing Laboratories, Inc., Chicago, Ill.
● Johnson Service Co., Milwaukee, Wis.
● Leeds & Northrup Co., Philadelphia, Pa.
Marsh Corp., Jas. P., Chicago, Ill.
Mason-Neilan Regulator Co., Boston, Mass.
● Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
Moeller Instrument Co., Richmond Hill, N. Y.
Palmer Co., Cincinnati (Norwood), O.
Philadelphia Thermometer Co., Philadelphia, Pa.
● Powers Regulator Co., Chicago, Ill.
Pyrometer Instrument Co., New York, N. Y.
Rochester Mfg. Co., Rochester, N. Y.
● Sarco Co., Inc., New York, N. Y.
Scientific Instrument Co., Detroit, Mich.
Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
Taylor Instrument Companies, Rochester, N. Y.
Thwing-Albert Instrument Co., Philadelphia, Pa.
Trerice Co., H. O., Detroit, Mich.
● United States Gauge Co., New York, N. Y.
Weksler Thermometer Corp., New York, N. Y.
Wheelco Instruments Co., Chicago, Ill.

THERMOMETERS, INDICATING, WALL

American Schaeffer & Budenberg Instrument Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn.
American Thermometer Co., St. Louis, Mo.
Bristol Co., Waterbury, Conn.
Brown Instrument Co., Div. of Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.
Electric Auto-Lite Co., Moto Meter Gauge & Equipment Div., La Crosse, Wis.
Fee & Stemwedel, Inc., Chicago, Ill.
Foxboro Co., Foxboro, Mass.
G. M. Mfg. Co., New York, N. Y.
H-B Instrument Co., Philadelphia, Pa.
Hill, E. Vernon, Chicago, Ill.
● Illinois Testing Laboratories, Inc., Chicago, Ill.
● Leeds & Northrup Co., Philadelphia, Pa.
● Martocello & Co., Jos. A., Philadelphia, Pa.
Moeller Instrument Co., Richmond Hill, N. Y.
Palmer Co., Cincinnati (Norwood), O.
Philadelphia Thermometer Co., Philadelphia, Pa.
Precision Thermometer & Instrument Co., Philadelphia, Pa.
Pyrometer Instrument Co., New York, N. Y.
Rochester Mfg. Co., Rochester, N. Y.
Scientific Instrument Co., Detroit, Mich.
Standard Thermometer, Inc., Boston, Mass.
Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
Taylor Instrument Companies, Rochester, N. Y.
Thwing-Albert Instrument Co., Philadelphia, Pa.
Trerice Co., H. O., Detroit, Mich.
● United States Gauge Co., New York, N. Y.
Weksler Thermometer Corp., New York, N. Y. (Effective temperature indicator)
Wheelco Instruments Co., Chicago, Ill.

THERMOMETERS, KATA

G. M. Mfg. Co., New York, N. Y.
Palmer Co., Cincinnati (Norwood), O.
Precision Thermometer & Instrument Co., Philadelpia, Pa.

THERMOSTATIC BELLOWS

See Bellows, Thermostatic

THERMOSTATIC BI-METALS

See Bi-Metals, Thermostatic

THERMOSTATIC TRAPS

See Traps, Steam, Thermostatic

THERMOSTATS, DUCT TYPE

Armstrong Heat Control Co., Portland, Ore.
Atlas Valve Co., Inc., Newark, N. J.
Au-Temp-Co Corp., New York, N. Y.
● Barber-Colman Co., Rockford, Ill.
Bristol Co., Waterbury, Conn.
Burling Instrument Co., Newark, N. J.
Cook Electric Co., Chicago, Ill.
● Detroit Lubricator Co., Detroit, Mich.
● Edison, Inc., Thomas A., Instrument Div., West Orange, N. J.
Friez Instrument Div., Bendix Aviation Corp., Towson, Md.
● Johnson Service Co., Milwaukee, Wis.
Leslie Co., Lyndhurst, N. J.
● Mercoid Corp., The, Chicago, Ill.
● Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
● Penn Electric Switch Co., Goshen, Ind.
Perfex Corp., Milwaukee, Wis.
Philadelphia Thermometer Co., Philadelphia, Pa.
● Powers Regulator Co., Chicago, Ill.
Precision Thermometer & Instrument Co., Philadelphia, Pa.
● Sarco Co., New York, N. Y.
● Sarcotherm Controls, Inc., Chicago, Ill.
Standard Thermometer, Inc., Boston, Mass.

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Superstat Co., Springfield, Mass.
Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
Tallmadge & Co., Webster, East Orange, N. J.
Taylor Instrument Companies, Rochester, N. Y.
United Electric Controls Co., Boston, Mass.
Vapor Car Heating Co., Inc., Chicago, Ill.
Webster Tallmadge & Co., East Orange, N. J.
● White-Rodgers Electric Co., St. Louis, Mo.

THERMOSTATS, EFFECTIVE TEMPERATURE

● Barber-Colman Co., Rockford, Ill.
Friez Instrument Div., Bendix Aviation Corp., Towson, Md.
● Illinois Engineering Co., Chicago, Ill.
● Johnson Service Co., Milwaukee, Wis.
● Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
● Powers Regulator Co., Chicago, Ill.
● Sarcotherm Controls, Inc., Chicago, Ill.

THERMOSTATS, IMMERSION

American Instrument Co., Silver Spring, Md.
Armstrong Heat Control Co., Portland, Ore.
Atlas Valve Co., Inc., Newark, N. J.
Au-Temp-Co Corp., New York, N. Y.
● Barber-Colman Co., Rockford, Ill.
Burling Instrument Co., Newark, N. J.
● Detroit Lubricator Co., Detroit, Mich.
● Edison, Inc., Thomas A., Instrument Div., West Orange, N. J.
Friez Instrument Div., Bendix Aviation Corp., Towson, Md.
● General Controls Co., Glendale, Calif.
General Electric Co., Schenectady, N. Y.
H-B Instrument Co., Philadelphia, Pa.
Hart Mfg. Co., Hartford, Conn.
Industrial Engineering Corp., Terre Haute, Ind.
● Johnson Service Co., Milwaukee, Wis.
Klipfel Mfg. Co., Chicago, Ill.
Leslie Co., Lyndhurst, N. J.
● Mercoid Corp., The, Chicago, Ill.
● Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
● Penn Electric Switch Co., Goshen, Ind.
Perfex Corp., Milwaukee, Wis.
Philadelphia Thermometer Co., Philadelphia, Pa.
Pioneer Heat Regulator Div., Master Electric Co., The, Dayton, O.
● Powers Regulator Co., Chicago, Ill.
Precision Thermometer & Instrument Co., Philadelphia, Pa.
Ranco, Inc., Columbus, O.
● Reading-Pratt & Cady Div., American Chain & Cable Co., Inc., Reading, Pa.
Red Spot Electric Co., Tacoma, Wash.
● Sarco Co., Inc., New York, N. Y.
● Sarcotherm Controls, Inc., Chicago, Ill.
Struthers Dunn, Inc., Philadelphia, Pa.
Superstat Co., Springfield, Mass.
Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
Taylor Instrument Companies, Rochester, N. Y.
Thwing-Albert Instrument Co., Philadelphia, Pa.
United Electric Controls Co., Boston, Mass.
Vapor Car Heating Co., Inc., Chicago, Ill.
Warren Electric Appliance Co., Warren, Pa.
Westinghouse Electric & Mfg. Co., Mansfield, O.
White Mfg. Co., St. Paul, Minn.
● White-Rodgers Electric Co., St. Louis, Mo.
Wilcolator Co., Elizabeth, N. J.

THERMOSTATS, RADIANT HEAT

● Sarcotherm Controls, Inc., Chicago, Ill.

THERMOSTATS, ROOM OR WALL

Armstrong Heat Control Co., Portland, Ore.
Au-Temp-Co Corp., New York, N. Y.
● Automatic Products Co., Milwaukee, Wis.
● Barber-Colman Co., Rockford, Ill.
Bristol Co., Waterbury, Conn.
Cook Electric Co., Chicago, Ill.
Crise Elec. Mfg. Co., Columbus, O.
● Detroit Lubricator Co., Detroit, Mich.
● Edison, Inc., Thomas A., Instrument Div., West Orange, N. J.
Friez Instrument Div., Bendix Aviation Corp., Towson, Md.
● Fulton Sylphon Co., Knoxville, Tenn.
● General Controls Co., Glendale, Calif.
General Electric Co., Schenectady, N. Y.
Gleason-Avery, Inc., Auburn, N. Y.
● Illinois Engineering Co., Chicago, Ill.
Industrial Engineering Corp., Terre Haute, Ind.
● Johnson Service Co., Milwaukee, Wis.
Magnet Switch Co., Chicago, Ill.
Marsh Tritrol Co., Chicago, Ill.
McCorkle Co., D. H., Berkeley, Calif.
● Mercoid Corp., The, Chicago, Ill.
● Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
● Penn Electric Switch Co., Goshen, Ind.
Perfex Corp., Milwaukee, Wis.
Pioneer Heat Regulator Div., Master Electric Co., The, Dayton, O.
● Powers Regulator Co., Chicago, Ill.
Sampsel Time Control, Inc., Spring Valley, Ill.
● Sarco Co., Inc., New York, N. Y.
● Sarcotherm Controls, Inc., Chicago, Ill.
Spencer Thermostat Co., Attleboro, Mass.
Standard Thermometer, Inc., Boston, Mass.
Superstat Co., Springfield, Mass.
Tallmadge & Co., Webster, East Orange, N. J
● Thrush & Co., H. A., Peru, Ind.
Tork Clock Co., Inc., Mt. Vernon, N. Y.
Triplex Heating Specialty Co., Peru, Ind.
United Electric Controls Co., Boston, Mass.
Vapor Car Heating Co., Inc., Chicago, Ill.
Webster Tallmadge & Co., East Orange, N. J.
White Mfg. Co., St. Paul, Minn.
● White-Rodgers Electric Co., St. Louis, Mo.

THERMOSTATS, SURFACE

Armstrong Heat Control Co., Portland, Ore.
Au-Temp-Co Corp., New York, N. Y.
● Barber-Colman Co., Rockford, Ill.
Bristol Co., Waterbury, Conn.
Cook Electric Co., Chicago, Ill.
● Detroit Lubricator Co., Detroit, Mich.
● Edison, Inc., Thomas A., Edison Electric Controls Div., West Orange, N. J.
Friez Instrument Div., Bendix Aviation Corp., Towson, Md.
Hart Mfg. Co., Hartford, Conn.
Industrial Engineering Corp., Terre Haute, Ind.
McCorkle Co., D. H., Berkeley, Calif.
● Mercoid Corp., The, Chicago, Ill.
● Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
● Penn Electric Switch Co., Goshen, Ind.
Perfex Corp., Milwaukee, Wis.
Pioneer Heat Regulator Div., Master Electric Co., The, Dayton, O.
● Powers Regulator Co., Chicago, Ill.
Ranco, Inc., Columbus, O.
● Sarco Co., Inc., New York, N. Y.
Struthers Dunn, Inc., Philadelphia, Pa.
Superstat Co., Springfield, Mass.
Triplex Heating Specialty Co., Peru, Ind.
United Electric Controls Co., Boston, Mass.
Westinghouse Electric & Mfg. Co., Mansfield, O.
White Mfg. Co., St. Paul, Minn.
● White-Rodgers Electric Co., St. Louis, Mo.

THERMOSTATS, TWO TEMPERATURE OR DUAL

Armstrong Heat Control Co., Portland, Ore.
Au-Temp-Co Corp., New York, N. Y.
● Barber-Colman Co., Rockford, Ill.
Burling Instrument Co., Newark, N. J.
● Detroit Lubricator Co., Detroit, Mich.
Friez Instrument Div., Bendix Aviation Corp., Towson, Md.
● General Controls Co., Glendale, Calif.
General Electric Co., Air Conditioning & Commercial Refrigeration Divisions, Bloomfield, N. J.
Gleason-Avery, Inc., Auburn, N. Y.
H-B Instrument Co., Philadelphia, Pa.
● Illinois Engineering Co., Chicago, Ill.
Industrial Engineering Corp., Terre Haute, Ind.
● Johnson Service Co., Milwaukee, Wis.
● Mercoid Corp., The, Chicago, Ill.
● Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
● Penn Electric Switch Co., Goshen, Ind.
Perfex Corp., Milwaukee, Wis.
Pioneer Heat Regulator Div., Master Electric Co., The, Dayton, O.
● Powers Regulator Co., Chicago, Ill.
Ranco, Inc., Columbus, O.
● Sarco Co., Inc., New York, N. Y.
Superstat Co., Springfield, Mass.
Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
Tallmadge & Co., Webster, East Orange, N. J.
United Electric Controls Co., Boston, Mass.
Vapor Car Heating Co., Inc., Chicago, Ill.
Webster Tallmadge & Co., East Orange, N. J.
● White-Rodgers Electric Co., St. Louis, Mo.

THERMOSTATS, WEATHER COMPENSATING

Au-Temp-Co Corp., New York, N. Y.
● Barber-Colman Co., Rockford, Ill.
Bristol Co., Waterbury, Conn.
● Detroit Lubricator Co., Detroit, Mich.
● Illinois Engineering Co., Chicago, Ill.
● Johnson Service Co., Milwaukee, Wis.
Lawler Automatic Controls, Mount Vernon, N. Y.
Major Controls Sales Div., Cambridge, Mass.
Marsh Tritrol Co., Chicago, Ill.
● Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
● Powers Regulator Co., Chicago, Ill.
● Sarco Co., Inc., New York, N. Y.
● Sarcotherm Controls, Inc., Chicago, Ill.
Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
Tallmadge & Co., Webster, East Orange, N. J.
● Thrush & Co., H. A., Peru, Ind.
United Electric Controls Co., Boston, Mass
Webster Tallmadge & Co., East Orange, N. J.

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TIME SWITCHES

See Switches, Time

TOGGLE BOLTS

See Bolts, Toggle and Anchor

TONGS, PIPE

- Armstrong Bros. Tool Co., Chicago, Ill.
- Billings & Spencer Co., Hartford, Conn.
- Jarecki Mfg. Co., Erie, Pa.
- Trimont Mfg. Co., Boston, Mass.
- ● Williams & Co., J. H., Buffalo, N. Y.

TOOLS (CHISELS, PLIERS, SCREW DRIVERS, ETC.)

- Acme Steel Co., Chicago, Ill. (Strapping tools for holding insulation in place on ducts, pipes, tanks, etc.)
- Bernz Co., Inc., Otto, Rochester, N. Y.
- Billings & Spencer Co., Hartford, Conn.
- ● Bonney Forge & Tool Works, Allentown, Pa.
- Crescent Tool Co., Jamestown, N. Y.
- Everhot Products Co., Chicago, Ill.
- Greene, Tweed & Co., New York, N. Y.
- Greenlee Tool Co., Rockford, Ill.
- International Nutyp Tool Co., Oswego, N. Y.
- Jessop Steel Co., Washington, Pa.
- Millers Falls Co., Greenfield, Mass.
- Parker-Kalon Corp., New York, N. Y.
- Peck, Stow & Wilcox Co., Southington, Conn.
- Snap-On Tools Corp., Kenosha, Wis.
- Stanley Electric Tool Div., The Stanley Works, New Britain, Conn.

TORCHES, BRAZING AND SOLDERING

- Aeroil Burner Co., Inc., West New York, N. J.
- ● Air Reduction Sales Co., New York, N. Y.
- Atkins & Co., E. C., Indianapolis, Ind.
- Bernz Co., Inc., Otto, Rochester, N. Y.
- Clayton & Lambert Mfg. Co., Dearborn, Mich.
- Dockson Corp., Detroit, Mich.
- Eclipse Fuel Engineering Co., Rockford, Ill.
- Ergolyte Mfg. Co., Philadelphia, Pa.
- Harris Calorific Co., The, Cleveland, O.
- Ideal Commutator Dresser Co., Sycamore, Ill.
- Imperial Brass Mfg. Co., Chicago, Ill.
- Insto-Gas Corp., Detroit, Mich.
- Johnson Gas Appliance Co., Cedar Rapids, Ia.
- Linde Air Products Co., The, Unit of Union Carbide & Carbon Corp., New York, N. Y.
- Liquid Carbonic Corp., The, Chicago, Ill.
- Lonn Mfg. Co., Inc., Chicago, Ill.
- Marquette Mfg. Co., Minneapolis, Minn.
- Milburn Co., Alexander, Baltimore, Md.
- Minn-Kota Foundry & Mfg. Co., Fargo, N. D.
- Modern Engineering Co., St. Louis, Mo.
- National Cylinder Gas Co., Chicago, Ill.
- National Safety Device Co., Chicago, Ill.
- Reiner & Campbell Co., Inc., Elizabeth, N. J.
- Sight Feed Generator Co., Richmond, Ind.
- Smith Welding Equipment Corp., Minneapolis, Minn.
- Torchweld Equipment Div., National Cylinder Gas Co., Chicago, Ill.
- Torit Mfg. Co., St. Paul, Minn.
- Trindl Products, Ltd., Chicago, Ill.
- Victor Equipment Co., San Francisco, Calif.
- Wall Chemicals Div. of The Liquid Carbonic Corp., Chicago, Ill.
- Welding Apparatus Co., Chicago, Ill.

TORQUE INDICATING WRENCHES

See Wrenches, Torque Indicating

TOWERS, COOLING, ATMOSPHERIC

- American Cooling Tower Co., Kansas City, Mo.
- Binks Mfg. Co., Chicago, Ill.
- Burhorn Co., Edwin, New York, N. Y.
- Fluor Corp., Ltd., The, Los Angeles, Calif.
- Foster Wheeler Corp., New York, N. Y.
- Harry Cooling Towers, Inc., New York, N. Y.
- ● Lilie-Hoffman Cooling Towers, Inc., St. Louis, Mo.
- ● Marley Co., Kansas City, Kans.
- National Engineering & Mfg. Co., Kansas City, Mo.
- ● New England Cooling Tower Co., Boston, Mass.
- Pennsylvania Engineering Wks., New Castle, Pa.
- Phillips Cooling Tower Co., Inc., New York, N. Y.
- Pritchard & Co., J. F., Kansas City, Mo.
- Research Corp., New York, N. Y.
- Schubert-Christy Corp., Indio, Calif.
- ● Spraying Systems Co., Chicago, Ill.
- Stewart Ice Machine Co., Los Angeles, Calif.
- Tippett & Wood, Phillipsburg, N. J.
- Water Cooling Corp., New York, N. Y.
- Water Cooling Equipment Corp., St. Louis, Mo.
- Water Cooling Tower Co., Chicago, Ill.
- ● Young Radiator Co., Racine, Wis. (radiator type)

TOWERS, COOLING, MECHANICAL DRAFT

- American Cooling Tower Co., Kansas City, Mo.
- Binks Mfg. Co., Chicago, Ill.
- Burhorn Co., Edwin, New York, N. Y.
- Fluor Corp., Ltd., The, Los Angeles, Calif.
- Foster Wheeler Corp., New York, N. Y.
- Harry Cooling Towers, Inc., New York, N. Y.
- ● Lilie-Hoffmann Cooling Towers, Inc., St. Louis, Mo.
- ● Marley Co., Kansas City, Kans.
- National Engineering & Mfg. Co., Kansas City, Mo.
- ● New England Cooling Tower Co., Boston, Mass.
- Pennsylvania Engineering Wks., New Castle, Pa.
- Phillips Cooling Tower Co., Inc., New York, N. Y.
- Pritchard & Co., J. F., Kansas City, Mo.
- Research Corp., New York, N. Y.
- Schubert-Christy Corp., Indio, Calif.
- Water Cooling Corp., New York, N. Y.
- Water Cooling Equipment Corp., St. Louis, Mo.
- Water Cooling Tower Co., Chicago, Ill.
- Wheeler Mfg. Co., C. H., Philadelphia, Pa.

TRANSMISSION DRIVES

See Drives, Chain, Flat Belt and V-Belt

TRAPS, STEAM, MECHANICAL

- ● American District Steam Co., North Tonawanda, N. Y.
- ● Anderson Co., V. D., The, Cleveland, O.
- ● Armstrong Machine Wks., Three Rivers, Mich.
- Barnes & Jones, Inc., Jamaica Plain, Boston, Mass.
- Bishop & Babcock Mfg. Co., Cleveland, O.
- Boylston Steam Specialty Co., Chicago, Ill.
- Bundy Steam Trap Co., Nashua, N. H.
- Burrows Mfg. Co., F. A., York, Pa.
- Cashin Co., W. D., Boston, Mass.
- Cochrane Corp., Philadelphia, Pa.
- Coe Mfg. Co., Painesville, O.
- Connor Engineering Corp., W. B., New York, N. Y.
- ● Crane Co., Chicago, Ill.
- Cryer Trap & Valve Co., Inc., New York, N. Y.
- Davis Engineering Corp., Elizabeth, N. J.
- Davis Regulator Co., Chicago, Ill.
- ● Dunham Co., C. A., Chicago, Ill.
- Ellis Drier Co., Chicago, Ill.
- ● Fisher Governor Co., Marshalltown, Ia.
- ● Haines & Co., William S., Philadelphia, Pa.
- Healy Ruff Co., St. Paul, Minn.
- ● Hoffman Specialty Co., Indianapolis, Ind.
- Huyette Co., Inc., Paul B., Philadelphia, Pa.
- ● Illinois Engineering Co., Chicago, Ill.
- Johnson Corp., Three Rivers, Mich.
- Justus Steam Trap Co., Napanoch, N. Y.
- Kaye & MacDonald, Inc., West Orange, N. J.
- Keckley Co., O. C., Chicago, Ill.
- ● Kieley & Mueller, Inc., North Bergen, N. J.
- Klipfel Mfg. Co., Chicago, Ill.
- Marsh Corp., Jas. P., Chicago, Ill.
- McAlear Mfg. Co., Chicago, Ill.
- McAuley Trap Co., Pittsburgh, Pa.
- Milwaukee Valve Co., Milwaukee, Wis.
- Monash-Younker Co., Chicago, Ill.
- Morehead Mfg. Co., Detroit, Mich.
- Mouat Vapor Heating Co., The, Cleveland, O.
- Mueller Steam Specialty Co., Inc., Long Island City, N. Y.
- Nason Co., Detroit, Mich.
- Nicholson & Co., W. H., Wilkes-Barre, Pa.
- ● Reading-Pratt & Cady Div., American Chain & Cable Co., Inc., Reading, Pa.
- ● Sarco Co., Inc., New York, N. Y.
- Schaub Engineering Co., Fred H., Chicago, Ill.
- Squires Co., C. E., Cleveland, O.
- ● Sterling, Inc., Milwaukee, Wis.
- Sterling Engineering & Mfg. Corp., Hyde Park, Mass.
- Stickle Steam Specialties Co., Indianapolis, Ind.
- Strong, Carlisle & Hammond Co., Cleveland, O.
- Swartwout Co., Cleveland, O.
- Templeton Bros., Boston, Mass. (Return)
- Templeton Mfg. Co., Hyde Park, Mass.
- ● Trane Co., The, LaCrosse, Wis.
- Trerice Co., H. O., Detroit, Mich.
- Vapor Specialty Co., New York, N. Y.
- Watson & McDaniel Co., Philadelphia, Pa.
- ● Webster & Co., Warren, Camden, N. J.
- Williams Gauge Co., Pittsburgh, Pa.
- Wright-Austin Co., Detroit, Mich.
- ● Yarnall-Waring Co., Philadelphia, Pa.

TRAPS, STEAM, THERMOSTATIC

- All-Vac Steam Control System, Chicago, Ill.
- ● American District Steam Co., North Tonawanda, N. Y.
- Barnes & Jones, Inc., Jamaica Plain, Boston, Mass.
- Bishop & Babcock Mfg. Co., Cleveland, O.
- Capitol Brass Works, Div. of Bohn Aluminum & Brass Corp., Detroit, Mich.
- Cashin Co., W. D., Boston, Mass.
- Clifford Mfg. Co., Boston, Mass.
- Cryer Trap & Valve Co., Inc., New York, N. Y.

● Advertisement in this issue. See Index to Advertisers, page 322.

- ● Dunham Co., C. A., Chicago, Ill.
- ● Haines & Co., William S., Philadelphia, Pa.
- ● Hoffman Specialty Co., Indianapolis, Ind.
- Huyette Co., Inc., Paul B., Philadelphia, Pa.
- ● Illinois Engineering Co., Chicago, Ill.
- Marsh Corp., Jas. P., Chicago, Ill.
- McAlear Mfg. Co., Chicago, Ill.
- Milwaukee Valve Co., Milwaukee, Wis.
- Monash-Younker Co., Chicago, Ill.
- Mouat Vapor Heating Co., The, Cleveland, O.
- Nicholson & Co., W. H., Wilkes-Barre, Pa.
- Pierce Butler Radiator Corp., Syracuse, N. Y.
- ● Powers Regulator Co., Chicago, Ill.
- ● Sarco Co., Inc., New York, N. Y.
- Simplex Heating Specialty Co., Inc., Lynchburg, Va.
- ● Sterling, Inc., Milwaukee, Wis.
- Stickle Steam Specialties Co., Indianapolis, Ind.
- Swartwout Co., Cleveland, O.
- Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
- ● Trane Co., The, LaCrosse, Wis.
- Trerice Co., H. O., Detroit, Mich.
- Vapor Car Heating Co., Inc., Chicago, Ill.
- Vapor Specialty Co., New York, N. Y.
- ● Webster & Co., Warren, Camden, N. J.

TREATMENT, STEAM SYSTEM, TO INHIBIT CORROSION

- ● Anderson-Stolz Corp., Kansas City, Mo.
- Cannon Chemical Co., Everett, Mass.
- Graver Tank & Mfg. Co., Inc., East Chicago, Ill.
- Haering Co., Inc., D. W., Chicago, Ill.
- Rid-Sludge Chemical Co., Minneapolis, Minn. (vapor treatment to remove sludge from heating system)
- Turco Products, Inc., Los Angeles, Calif.
- Vinco Co., Inc., The, New York, N. Y.
- Water Treatment Co. of America, Pittsburgh, Pa.
- Western Chemical Co., Kansas City, Mo.

TREATMENT, WATER, TO INHIBIT CORROSION

- Activator Process Sales Co., Alhambra, Calif.
- ● Allis-Chalmers Mfg. Co., Milwaukee, Wis.
- American K. A. T. Corp., New York, N. Y.
- American Water Softener Co., Philadelphia, Pa.
- American Well Works, Aurora, Ill.
- ● Anderson-Stolz Corp., Kansas City, Mo.
- Aquatic Chemical Laboratories, Inc., New York, N. Y.
- Automatic Pump & Softener Corp., Rockford, Ill.
- Calgon, Inc., Pittsburgh, Pa.
- ● Cannon Chemical Co., Everett, Mass.
- Cochrane Corp., Philadelphia, Pa.
- Continental Products Co., Euclid, O.
- Dearborn Chemical Co., Chicago, Ill.
- Electroaire Corp., Chicago, Ill.
- Elgin Softener Corp., Elgin, Ill.
- Ferro-Nil Corp., New York, N. Y.
- ● Filtrine Mfg. Co., Inc., Brooklyn, N. Y.
- Graver Tank & Mfg. Co., Inc., East Chicago, Ind.
- Grief, Edward C., Bogota, N. J.
- Haering Co., D. W., Chicago, Ill.
- Hagan Corp., Pittsburgh, Pa.
- Maintenance Engineering Corp., Houston, Tex.
- Metropolitan Refining Co., Long Island City, N. Y.
- Monsanto Chemical Co., Organic Chemicals Div., St. Louis, Mo.
- Mutual Chemical Co. of America, New York, N. Y.
- National Aluminate Corp., Chicago, Ill.
- North American Fibre Products Co., The, Cleveland, O.
- Norwood Filtration Co., The, Florence, Mass.
- Oakite Products, Inc., New York, N. Y.
- % Proportioneers, Inc., %, Providence, R. I.
- Permutit Co., New York, N. Y.
- R. U. V. Engineering Corp., New York, N. Y.
- Red Jacket Mfg. Co., Davenport, Ia.
- Refinite Corp., Omaha, Nebr.
- ● Research Products Corp., Madison, Wis.
- Solvay Sales Corp., New York, N. Y.
- Sudbury Laboratory, South Sudbury, Mass.
- Turco Products, Inc., Los Angeles, Calif.
- Uniflow Mfg. Co., Erie, Pa.
- Vinco Co., Inc., The, New York, N. Y.
- Wallace & Tiernan Co., Inc., Newark, N. J.
- Warlo Corp., New York, N. Y.
- Water Refining Co., Ft. Wayne, Ind.
- Water Service Laboratories, Inc., New York, N. Y.
- Water Treatment Company of America, Pittsburgh, Pa.
- Western Chemical Co., Kansas City, Mo.
- ● Worthington Pump & Machinery Corp., Harrison, N. J.

TUBE CLEANERS

See Cleaners, Tube

TUBES, BOILER

- Allegheny Ludlum Steel Corp., Brackenridge, Pa.
- Babcock & Wilcox Co., New York, N. Y.
- Bethlehem Steel Co., Bethlehem, Pa.
- Chase Brass & Copper Co., Waterbury, Conn.
- Globe Steel Tubes Co., Milwaukee, Wis.
- Jones & Laughlin Steel Corp., Pittsburgh, Pa.
- National Tube Co., United States Steel Corp. Sub., Pittsburgh, Pa.
- Pittsburgh Steel Co., Pittsburgh, Pa.
- Steel & Tubes, Div. of Republic Steel Corp., Cleveland, O.
- Talon, Inc., Steel Tubes Div., Oil City, Pa.
- Timken Roller Bearing Co., Steel & Tube Div., Canton, O.

TUBES, PITOT

- Bacharach Industrial Instrument Co., Pittsburgh, Pa.
- Defender Automatic Regulator Co., St. Louis, Mo.
- Detroit Air Meter Co., Detroit, Mich.
- Foxboro Co., Foxboro, Mass.
- Friez Instrument Div., Bendix Aviation Corp., Towson, Md.
- Hill, E. Vernon, Chicago, Ill.
- Meriam Co., The, Cleveland, O.

TUBING, ALUMINUM

- Aluminum Co. of America, Pittsburgh, Pa.
- Brasco Mfg. Co., Harvey, Ill.
- Lewin-Mathes Co., Lewin Metals Div., St. Louis, Mo.
- Revere Copper and Brass Incorporated, New York, N. Y.
- Wolverine Tube Div. of Calumet and Hecla Consolidated Copper Co., Detroit, Mich.

TUBING BENDERS

See Benders, Tubing

TUBING, BRASS AND COPPER

- ● American Brass Co., Waterbury, Conn.
- Bridgeport Brass Co., Bridgeport, Conn.
- Chase Brass & Copper Co., Waterbury, Conn.
- Conklin Brass & Copper Co., Inc., T. E., New York, N. Y.
- Downs-Smith Brass & Copper Co., New York, N. Y.
- Hussey & Co., C. G., Pittsburgh, Pa.
- Imperial Brass Mfg. Co., Chicago, Ill.
- Lewin-Mathes Co., Lewin Metals Div., St. Louis, Mo.
- Mueller Brass Co., Port Huron, Mich.
- Parker Appliance Co., Cleveland, O.
- Phelps Dodge Copper Products Corp., British American Tube Div., New York, N. Y.
- Revere Copper and Brass, Incorporated, New York, N. Y.
- Roberts Tube Works, Detroit, Mich.
- Western Cartridge Co., Brass Mill Div., East Alton, Ill.
- Wolverine Tube Div. of Calumet and Hecla Consolidated Copper Co., Detroit, Mich.

TUBING CUTTERS

See Cutters, Tubing

TUBING, FINNED

- Aerofin Corp., Syracuse, N. Y.
- Brown Fintube Co., The, Elyria, O.
- ● Bush Mfg. Co., Hartford, Conn.
- Chase Brass & Copper Co., Waterbury, Conn.
- ● G. & O. Mfg. Co., New Haven, Conn.
- Industrial Mfg. & Engineering Co., Chicago, Ill.
- ● Kramer Trenton Co., Trenton, N. J.
- Manufacturers Fin Coil Co., Chicago, Ill.
- ● McCord Radiator & Mfg. Co., Detroit, Mich.
- McQuay, Inc., Minneapolis, Minn.
- Peerless of America, Inc., Chicago, Ill.
- Refrigeration Economics Co., Inc., Canton, O.
- Rempe Co., Chicago, Ill.
- Rome-Turney Radiator Co., Rome, N. Y.
- ● Tilco-Fin, Inc., Brooklyn, N. Y.
- Vapor Car Heating Co., Inc., Chicago, Ill.
- Wolverine Tube Div. of Calumet and Hecla Consolidated Copper Co., Detroit, Mich. (Aluminum, copper)

TUBING, NICKEL AND NICKEL ALLOY

- Chase Brass & Copper Co., Waterbury, Conn.
- General Plate Div., Metals & Controls Corp., Attleboro, Mass.
- Globe Steel Tubes Co., Milwaukee, Wis.
- International Nickel Co., New York, N. Y.
- Pittsburgh Steel Co., Pittsburgh, Pa.
- Revere Copper and Brass, Incorporated, New York, N. Y.
- Western Cartridge Co., Brass Mill Div., East Alton, Ill.

TUBING, PLASTIC

- Acadia Synthetic Products Div., Western Felt Works, Chicago, Ill.
- Carter Products Corp., Cleveland, O.
- Celanese Celluloid Corp., New York, N. Y.
- Colonial Alloys Co., Metals Div., Philadelphia, Pa.
- Commercial Plastics Co., Chicago, Ill.
- ● Dow Chemical Co., Midland, Mich.
- Extruded Plastics, Inc., Norwalk, Conn.
- Firestone Tire & Rubber Co., Akron, O.
- General Electric Co., Plastics Div., Pittsfield, Mass.
- Hodgman Rubber Co., Framingham, Mass.
- Irvington Varnish and Insulator Co., Irvington, N. J.

● Advertisement in this issue. See Index to Advertisers, page 322.

Mills Corp., Elmer E., Chicago, Ill.
North Penn Co., New York, N. Y.
Parker Appliance Co., The, Cleveland, O.
Resistoflex Corp., Belleville, N. J.
Skuttle Mfg. Co., Detroit, Mich.
United States Stoneware Co., New York, N. Y.
Werner Co., Inc., R. D., New York, N. Y.
Yardley Plastics Co., Columbus, O.

TUBING, SILVER CLAD AND SILVER ALLOY

General Plate Div., Metals & Controls Corp., Attleboro, Mass.

TUBING, STEEL

Allegheny Ludlum Steel Corp., Brackenridge, Pa.
Babcock & Wilcox Tube Co., The, Beaver Falls, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Brasco Mfg. Co., Harvey, Ill.
Bundy Tubing Co., Detroit, Mich.
Detroit Seamless Steel Tubes Co., Detroit, Mich.
Everhot Products Co., Chicago, Ill.
Globe Steel Tubes Co., Milwaukee, Wis.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Laclede Steel Co., St. Louis, Mo.
National Tube Co., United States Steel Corp. Sub., Pittsburgh, Pa.
Pittsburgh Steel Co., Pittsburgh, Pa.
Pittsburgh Tube Co., Pittsburgh, Pa.
Revere Copper and Brass, Incorporated, New York, N. Y.
South Chester Tube Co., Chester, Pa.
● Spang-Chalfant, Div. of National Supply Co., Pittsburgh, Pa.
Standard Tube Co., Highland Park, Mich.
Steel and Tubes, Div. of Republic Steel Corp., Cleveland, O.
Talon, Inc., Steel Tube Div., Oil City, Pa.
Timken Roller Bearing Co., Steel & Tube Div., Canton, O.
Wheatland Tube Co., Philadelphia, Pa.
Wheeling Steel Corp., Wheeling, W. Va.
● Youngstown Sheet & Tube Co., Youngstown, O.

TUBING, STEEL, STAINLESS

Allegheny Ludlum Steel Corp., Brackenridge, Pa.
Alloy Steel Products Co., Linden, N. J.
Babcock & Wilcox Tube Co., The, Beaver Falls, Pa.
Brasco Mfg. Co., Harvey, Ill.
Carpenter Steel Co., The, Welded Alloy Tube Div., Kenilworth, N. J.
Chicago Metal Hose Corp., Maywood, Ill. (Flexible)
Colonial Alloys Co., Metals Div., Philadelphia, Pa.
Duraloy Co., Scottdale, Pa.
Globe Steel Tubes Co., Milwaukee, Wis.
National Tube Co., United States Steel Corp. Sub., Pittsburgh, Pa.
Pittsburgh Steel Co., Pittsburgh, Pa.
Steel and Tubes, Div. of Republic Steel Corp., Cleveland, O.
Timken Roller Bearing Co., Steel & Tube Div., Canton, O.

TURBINES, MECHANICAL DRIVE

● Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Carling Blower Co., Worcester, Mass.
Coppus Engineering Corp, Worcester, Mass.
Dean Hill Pump Co., Indianapolis, Ind.
De Laval Steam Turbine Co., Trenton, N. J.
Elliott Co., Jeannette, Pa.
General Electric Co., Schenectady, N. Y.
Moore Steam Turbine Div., Worthington Pump and Machinery Corp., Wellsville, N. Y.
Murray Iron Wks. Co., Burlington, Ia.
Pyle-National Co., The, Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Terry Steam Turbine Co., Hartford, Conn.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
● Wing Mfg. Co., L. J., New York, N. Y.

2, 3 AND 4-WAY VALVES

See Valves, 2, 3 and 4-way

UNDERGROUND PIPING

See Conduit, Underground Piping

UNIONS, BRASS

Acheson Mfg. Co., Rankin, Pa.
Belknap Mfg. Co., Bridgeport, Conn.
Bowser, Inc., Fort Wayne, Ind.
Chase Brass & Copper Co., Waterbury, Conn.
Commonwealth Brass Corp., Detroit, Mich.
Conklin Brass & Copper Co., Inc., T. E., New York, N. Y.
● Crane Co., Chicago, Ill.
Flagg & Co., Inc., Stanley G., Philadelphia, Pa.
● Flori Pipe Co., The, St. Louis, Mo.
General Fittings Co., Providence, R. I.
Grabler Mfg. Co., Cleveland, O.
Hays Mfg. Co., Erie, Pa.
Imperial Brass Mfg. Co., Chicago, Ill.
Jarecki Mfg. Co., Erie, Pa.
● Kennedy Valve Mfg. Co., The, Elmira, N. Y.
King Union Co., Inc., Hillsgrove, R. I.
Leavitt Machine Co., Orange, Mass.
Lunkenheimer Co., Cincinnati, O.
Mueller Brass Co., Port Huron, Mich.
Parker Appliance Co., Cleveland, O.
Phoenix Brass Fittings Corp., Irvington, N. J.
Powell Co., Wm., Cincinnati, O.
Rhode Island Fittings Co., Hillsgrove, R. I.
Union Metal Works, Chelsea, Mass.
● Walworth Co., New York, N. Y.
Ward Foundries, Inc., J. P. Blossburg, Pa.
Williams Valve Co., D. T., Cincinnati, O.

UNIONS, MALLEABLE, BRASS SEAT

Corley Co., Jersey City, N. J.
● Crane Co., Chicago, Ill.
Dart Mfg. Co., E. M., Providence, R. I.
Detroit Brass & Malleable Wks., Detroit, Mich.
Fairbanks Co., New York, N. Y.
Flagg & Co., Inc., Stanley G., Philadelphia, Pa.
● Flori Pipe Co., The, St. Louis, Mo.
General Fittings Co., Providence, R. I.
Grabler Mfg. Co., Cleveland, O.
● Grinnell Co., Inc., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Jarecki Mfg. Co., Erie, Pa.
Jefferson Union Co., Inc., Lockport, N. Y.
● Kennedy Valve Mfg. Co., The, Elmira, N. Y.
King Union Co., Inc., Hillsgrove, R. I.
Malleable Iron Fittings Co., Branford, Conn.
Pittsburgh Valve & Fittings Corp., Barberton, O.
Rhode Island Fittings Co., Hillsgrove, R. I.
Rockwood Sprinkler Co., Worcester, Mass.
Star Mfg. Co., Inc., Providence, R. I.
Stockham Pipe Fittings Co., Birmingham, Ala.
United Superior Union Co., Inc., Brooklyn, N. Y.
● Walworth Co., New York, N. Y.
Ward Foundries, Inc., J. P., Blossburg, Pa.

UNIONS, STEEL

Alloy Steel Products Co., Linden, N. J. (Stainless steel)
Catawissa Valve & Fittings Co., Catawissa, Pa.
Champion Machine & Forging Co., Cleveland, O.
Colonial Alloys Co., Metals Div., Philadelphia, Pa. (Stainless)
● Crane Co., Chicago, Ill.
● Flori Pipe Co., The, St. Louis, Mo.
Frick Co., Waynesboro, Pa.
Hasco Valve & Machine Co., Milwaukee, Wis.
Rockwood Sprinkler Co., Worcester, Mass.
Roessing Mfg. Co., Pittsburgh, Pa.
Vogt Machine Co., Henry, Louisville, Ky.
● Walworth Co., New York, N. Y.
Watson-Stillman Co., Roselle, N. J.

UNIT COOLERS

See Coolers, Unit

UNIT HEATERS

See Heaters, Unit

UNIT VENTILATORS

See Ventilators, Unit

UNITS, AIR CONDITIONING, CENTRAL STATION TYPE

Self contained blower, heating and/or cooling coil, filter, humidifier unit for remote location and duct air distribution

● Air & Refrigeration Corp., New York, N. Y.
● Airtemp Div. of Chrysler Corp., Dayton, O.
● Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American Blower Corp., Detroit, Mich.
American Cooling Tower Co., Kansas City, Mo.
Anetsberger Bros., Chicago, Ill.
● Baker Ice Machine Co., Inc., Omaha, Neb.
Beacon-Morris Corp., Boston, Mass. (Custom built)
Betz Engineering Co., Kansas City, Mo.
Betz Corp., Hammond, Ind.
● Bryant Heater Co., The, Cleveland, O.
● Buffalo Forge Co., Buffalo, N. Y.
Carrier Corp., Syracuse, N. Y.
● Clarage Fan Co., Kalamazoo, Mich.
● Curtis Refrigerating Machine Co., St. Louis, Mo.
Drayer & Hanson, Inc., Los Angeles, Calif.
● Fedders Mfg. Co., Inc., Buffalo, N. Y.
Forman Air Conditioning & Engrg. Co., New York, N. Y.
Frigidaire Div., General Motors Corp., Dayton, O.
General Electric Co., Air Conditioning and Commercial Refrigeration Divisions, Bloomfield, N. J.
General Refrigeration Div., Yates-American Machine Co., Beloit, Wis.
Governair Corp., Oklahoma City, Okla.
Hastings Air Conditioning Co., Hastings, Neb.
Howe Ice Machine Co., Chicago, Ill.
● Ilg Electric Ventilating Co., Chicago, Ill.
Jaden Mfg. Co., Inc., F., Hastings, Neb.
Kauffman Air Conditioning Corp., St. Louis, Mo.

● Advertisement in this issue. See Index to Advertisers, page 322.

- ● Kennard, Inc., Sam, St. Louis, Mo.
- ● Kramer Trenton Co., Trenton, N. J.
- ● Marlo Coil Co., St. Louis, Mo.
- McQuay, Inc., Minneapolis, Minn.
- Micheli Air Conditioning Co., Inc., Schenectady, N. Y.
- Niagara Blower Co., New York, N. Y.
- Palmer's Mfg. Corp., Phoenix, Ariz.
- Pernot & Rich, Inc., Los Angeles, Calif.
- Refrigeration Economics Co., Inc., Canton, O.
- ● Skinner Heating & Ventilating Co., Inc., Div. of St. Louis Blow Pipe & Heater Co., St. Louis, Mo.
- Stainless & Steel Products Co., St. Paul, Minn.
- Standard Computing Scale Co., The, Air Conditioning and Refrigeration Div., Detroit, Mich.
- Sturtevant Co., B. F., Hyde Park, Boston, Mass.
- Surface Combustion, Toledo, O.
- ● Trane Co., The, La Crosse, Wis.
- ● United States Air Conditioning Corp., Minneapolis, Minn.
- United States Radiator Corp., Detroit, Mich.
- Vilter Mfg. Co., Milwaukee, Wis.
- Westinghouse Electric & Mfg. Co., Springfield, Mass.
- ● Worthington Pump & Machinery Corp., Air Conditioning and Refrigeration Div., Harrison, N. J.
- X L Refrigerating Co., Chicago, Ill.
- York Corp., York, Pa.
- ● Young Radiator Co., Racine, Wis.

UNITS, AIR CONDITIONING, HORIZONTAL PACKAGE TYPE

Self contained blower, cooling and/or heating coil, filter, humidifier unit for ceiling or platform location in space condition, for connection to remote compressor or cold water supply, and steam or hot water

- ● Airtemp, Div. of Chrysler Corp., Dayton, O.
- American Blower Corp., Detroit, Mich.
- ● Baker Ice Machine Co., Inc., Omaha, Neb.
- Beacon-Morris Corp., Boston, Mass. (Custom built)
- Betz Corp., Hammond, Ind.
- ● Buffalo Forge Co., Buffalo, N. Y.
- Carrier Corp., Syracuse, N. Y.
- Champion Unit Heater Co., Chicago, Ill.
- ● Clarage Fan Co., Kalamazoo, Mich.
- Conditionaire Unit Co., Chicago, Ill.
- ● Curtis Refrigerating Machine Co., St. Louis, Mo.
- Drayer & Hanson, Inc., Los Angeles, Calif.
- ● Fedders Mfg. Co., Inc., Buffalo, N. Y.
- Frigidaire Div., General Motors Corp., Dayton, O.
- General Electric Co., Air Conditioning and Commercial Refrigeration Divisions, Bloomfield, N. J.
- General Refrigeration Div., Yates-American Machine Co., Beloit, Wis.
- Hastings Air Conditioning Co., Hastings, Neb.
- ● Ilg Electric Ventilating Co., Chicago, Ill.
- Jaden Mfg. Co., Inc., F., Hastings, Neb.
- Kauffman Air Conditioning Corp., St. Louis, Mo.
- ● Kennard, Inc., Sam, St. Louis, Mo.
- King Ventilating Co., Owatonna, Minn.
- ● Kramer Trenton Co., Trenton, N. J.
- ● Marlo Coil Co., St. Louis, Mo.
- Mayflower Air-Conditioners, Inc., St. Paul, Minn.
- McQuay, Inc., Minneapolis, Minn.
- Niagara Blower Co., New York, N. Y.
- Refrigeration Economics Co., Inc., Canton, O.
- Rempe Co., Chicago, Ill.
- ● Skinner Heating & Ventilating Co., Inc., Div. of St. Louis Blow Pipe & Heater Co., St. Louis, Mo.
- Stainless & Steel Products Co., St. Paul, Minn.
- Standard Computing Scale Co., The, Air Conditioning and Refrigeration Div., Detroit, Mich.
- Sturtevant Co., B. F., Boston, Mass.
- ● Trane Co., The, La Crosse, Wis.
- ● United States Air Conditioning Corp., Minneapolis, Minn.
- United States Radiator Corp., Detroit, Mich.
- Vilter Mfg. Co., Milwaukee, Wis.
- Western Blower Co., Seattle, Wash.
- Westinghouse Electric & Mfg. Co., Springfield, Mass.
- ● Worthington Pump & Machinery Corp., Air Conditioning and Refrigeration Div., Harrison, N. J.
- X L Refrigerating Co., Chicago, Ill.
- York Corp., York, Pa.
- ● Young Radiator Co., Racine, Wis.

UNITS, AIR CONDITIONING, INDUSTRIAL TYPE

- ● Air & Refrigeration Corp., New York, N. Y.
- American Blower Corp., Detroit, Mich.
- American Cooling Tower Co., Kansas City, Mo.
- Anetsberger Bros., Chicago, Ill.
- Bahnson Co., Winston-Salem, N. C.
- ● Baker Ice Machine Co., Inc., Omaha, Neb.
- Beacon-Morris Corp., Boston, Mass. (Custom built)
- Betz Corp., Hammond, Ind.
- Betz Engineering Co., Kansas City, Mo.
- ● Bryant Heater Co., The, Cleveland, O.
- ● Buffalo Forge Co., Buffalo, N. Y.
- Carrier Corp., Syracuse, N. Y.
- ● Clarage Fan Co., Kalamazoo, Mich.
- ● Curtis Refrigerating Machine Co., St. Louis, Mo.
- Drayer & Hanson, Inc., Los Angeles, Calif.
- Economy Equipment Co., Inc., Chicago, Ill.
- ● Fedders Mfg. Co., Inc., Buffalo, N. Y.
- Frick Co., Waynesboro, Pa.
- General Electric Co., Air Conditioning & Commercial Refrigeration Divisions, Bloomfield, N. J.
- General Refrigeration Div., Yates-American Machine Co., Beloit Wis.
- Howe Ice Machine Co., Chicago, Ill.
- Industrial Mfg. & Engineering Co., Chicago, Ill.
- ● Ingersoll-Rand, New York, N. Y.
- International Moistening Co., Providence, R. I.
- Jaden Mfg. Co., Inc., F., Hastings, Neb.
- Kauffman Air Conditioning Corp., St. Louis, Mo.
- ● Kennard, Inc., Sam, St. Louis, Mo.
- ● Kramer Trenton Co., Trenton, N. J.
- Lintern Co., Berea, O.
- ● Marlo Coil Co., St. Louis, Mo.
- McQuay, Inc., Minneapolis, Minn.
- Niagara Blower Co., New York, N. Y.
- Norwood Filtration Co., The, Florence, Mass.
- Parks-Cramer Co., Fitchburg, Mass.
- Pfening Co., Fred D., Columbus, O.
- Refrigeration Economics Co., Inc., Canton, O.
- Rempe Co., Chicago, Ill.
- Research Corp., New York, N. Y.
- Ross Engineering Corp., J. O., New York, N. Y.
- ● Skinner Heating & Ventilating Co., Inc., Div. of St. Louis Blow Pipe & Heater Co., St. Louis, Mo.
- Somers, Inc., H. J., Detroit, Mich.
- Sturtevant Co., B. F., Hyde Park, Boston, Mass.
- Surface Combustion, Toledo, O.
- Tenney Engineering, Inc., Montclair, N. J. (including test chambers)
- ● Trane Co., The, La Crosse, Wis.
- Vilter Mfg. Co., Milwaukee, Wis.
- Westinghouse Electric & Mfg. Co., Springfield, Mass.
- ● Worthington Pump & Machinery Corp., Air Conditioning and Refrigeration Div., Harrison, N. J.
- X L Refrigerating Co., Chicago, Ill.
- York Corp., York, Pa.
- ● Young Radiator Co., Racine, Wis.

UNITS, AIR CONDITIONING, SUMMER, EVAPORATIVE COOLING TYPE

For cooling with sprays, no dehumidification

- ● Air & Refrigeration Corp., New York, N. Y.
- Air-O-Line Co., The, Dallas, Tex.
- American Blower Corp., Detroit, Mich.
- American Cooling Tower Co., Kansas City, Mo.
- American Metal Products Co., Fort Worth, Tex.
- April Showers Co., Washington, D. C.
- Aqua-Mist Co., Topeka, Kans.
- Atlas Heating & Ventilating Co., Ltd., San Francisco, Calif.
- Beacon-Morris Corp., Boston, Mass.
- Bien Air Conditioning Co., Bell, Calif.
- Campbell Heating Co., E. K., Kansas City, Mo.
- Carrier Corp., Syracuse, N. Y.
- Dallas Engineering Co., Inc., Dallas, Tex.
- Economy Electric Mfg. Co., Chicago, Ill.
- Electrogas Furnace Co., San Francisco, Calif.
- Essick Mfg. Co., Los Angeles, Calif.
- Farr Co., Los Angeles, Calif.
- Great National Air Conditioning Corp., Dallas, Tex.
- Montag Stove & Furnace Works, Portland, Ore.
- Mountain States Equipment Co., Denver, Colo.
- National Engineering & Mfg. Co., Kansas City, Mo.
- Norman Sheet Metal Mfg. Co., W. F., Nevada, Mo.
- Palmers Mfg. Corp., Phoenix, Ariz.
- Pernot & Rich, Inc., Los Angeles, Calif.
- Royal Air Conditioning Equipment Co., Alhambra, Calif.
- Shreveport Engineering Co., Inc., Shreveport, La.
- Spray-Wheel Air Conditioners, Inc., Denver, Colo.
- ● United States Air Conditioning Corp., Minneapolis, Minn.
- Utility Fan Corp., Los Angeles, Calif.
- Western Blower Co., Seattle, Wash.
- X L Refrigerating Co., Chicago, Ill.
- ● Young Radiator Co., Racine, Wis.

UNITS, AIR CONDITIONING, SUMMER, ROOM TYPE, FLOOR CABINET, REMOTE COMPRESSOR OR COLD WATER, UNDER 3 TONS CAPACITY

Self contained blower, coil, filter unit for connection to remote compressor or cold water supply

- Airgard Mfg. Co., Chicago, Ill.
- ● Airtemp, Div. of Chrysler Corp., Dayton, O.
- Betz Engineering Co., Kansas City, Mo.
- Carrier Corp., Syracuse, N. Y.
- General Air Conditioning Corp., Cincinnati, O.
- General Electric Co., Air Conditioning and Commercial Refrigeration Divisions, Bloomfield, N. J.
- Giant Mfg. Co., Council Bluffs, Ia.
- Hastings Air Conditioning Co., Hastings, Neb.
- ● Ilg Electric Ventilating Co., Chicago, Ill.
- Jaden Mfg. Co., Inc., F., Hastings, Neb.
- Kauffman Air Conditioning Corp., St. Louis, Mo.
- ● Kennard, Inc., Sam, St. Louis, Mo.
- King Ventilating Co., Owatonna, Minn.
- McQuay, Inc., Minneapolis, Minn.

● Advertisement in this issue. See Index to Advertisers, page 322.

- Norwin Co., Freeport, Ill.
- Peerless of America, Inc., Chicago, Ill.
- Premier Furnace Co., Dowagiac, Mich.
- Scott-Newcomb, Inc., St. Louis, Mo.
- Standard Computing Scale Co., The, Air Conditioning and Refrigeration Div., Detroit, Mich.
- ● Trane Co., The, La Crosse, Wis.
- Unified Air Conditioner Co., Duluth, Minn.
- ● United States Air Conditioning Corp., Minneapolis, Minn.
- X L Refrigerating Co., Chicago, Ill.
- York Corp., York, Pa.
- ● Young Radiator Co., Racine, Wis.

UNITS, AIR CONDITIONING, SUMMER, ROOM TYPE, FLOOR CABINET, SELF CONTAINED COMPRESSOR, UNDER 3 HP

Self contained blower, coil, compressor, filter unit

- ● Airtemp, Div. of Chrysler Corp., Dayton, O.
- Carrier Corp., Syracuse, N. Y.
- Gale Products, Galesburg, Ill.
- General Electric Co., Air Conditioning and Commercial Refrigeration Divisions, Bloomfield, N. J.
- Harvey-Whipple, Inc., Springfield, Mass.
- Ice Cooling Appliance Corp., Morrison, Ill. (Ice)
- ● Ilg Electric Ventilating Co., Chicago, Ill.
- Indian Trailer Corp., Koolroom Div., Chicago, Ill.
- Kauffman Air Conditioning Corp., St. Louis, Mo.
- Peerless of America, Inc., Chicago, Ill.
- Philco Corp., Philadelphia, Pa.
- Pleasantaire Corp. of America, Washington, D. C.
- Premier Furnace Co., Dowagiac, Mich.
- Scott-Newcomb, Inc., St. Louis, Mo.
- York Corp., York, Pa.

UNITS, AIR CONDITIONING, SUMMER, STORE TYPE, FLOOR CABINET, SELF CONTAINED COMPRESSOR, 3 HP AND OVER

Self contained blower, coil, compressor, filter unit with air discharge approximately 6 ft above floor

- ● Airtemp, Div. of Chrysler Corp., Dayton, O.
- ● Baker Ice Machine Co., Inc., Omaha, Neb.
- Brunner Mfg. Co., Utica, N. Y.
- Carrier Corp., Syracuse, N. Y.
- ● Clarage Fan Co., Kalamazoo, Mich.
- ● Curtis Refrigerating Machine Co., St. Louis, Mo.
- Forman Air Conditioning & Engrg. Co., New York, N. Y.
- Frick Co., Waynesboro, Pa.
- Frigidaire Div., General Motors Corp., Dayton, O.
- General Electric Co., Air Conditioning and Commercial Refrigeration Divisions, Bloomfield, N. J.
- General Refrigeration Div., Yates-American Machine Co., Beloit, Wis.
- Kauffman Air Conditioning Corp., St. Louis, Mo.
- Nevinger Mfg. Co., Inc., Greenville, Ill.
- Niagara Blower Co., New York, N. Y.
- Peerless of America, Inc., Chicago, Ill.
- Scott-Newcomb, Inc., St. Louis, Mo.
- Vilter Mfg. Co., Milwaukee, Wis.
- Westinghouse Electric & Mfg. Co., Springfield, Mass.
- ● Worthington Pump & Machinery Corp., Air Conditioning and Refrigeration Div., Harrison, N. J.
- X L Refrigerating Co., Chicago, Ill.
- York Corp., York, Pa.

UNITS, AIR CONDITIONING, WINTER, ROOM TYPE, FLOOR CABINET

Self contained blower, filter, heating coil, humidifier unit

- ● Air & Refrigeration Corp., New York, N. Y.
- ● Burnham Boiler Corp., Irvington, N. Y.
- Campbell Heating Co., Des Moines, Ia.
- Carrier Corp., Syracuse, N. Y.
- ● Clarage Fan Co., Kalamazoo, Mich.
- General Electric Co., Air Conditioning and Commercial Refrigeration Divisions, Bloomfield, N. J.
- ● Ilg Electric Ventilating Co., Chicago, Ill.
- Kauffman Air Conditioning Corp., St. Louis, Mo.
- ● Kennard, Inc., Sam, St. Louis, Mo.
- McQuay, Inc., Minneapolis, Minn.
- Peerless of America, Inc., Chicago, Ill.
- Refrigeration Economics Co., Inc., Canton, O.
- ● Reznor Mfg. Co., Mercer, Pa.
- Richmond Radiator Co., Gas Products Div., Uniontown, Pa.
- Somers, Inc., H. J., Detroit, Mich.
- Standard Computing Scale Co., The, Air Conditioning and Refrigeration Div., Detroit, Mich.
- Surface Combustion, Toledo, O.
- ● Trane Co., The, La Crosse, Wis.
- Unified Air Conditioner Co., Duluth, Minn.
- ● United States Air Conditioning Corp., Minneapolis, Minn.
- Viking Mfg. Corp., Dayton, O.
- York Corp., York, Pa.
- ● Young Radiator Co., Racine, Wis.

UNITS, AIR CONDITIONING, YEAR AROUND, ROOM TYPE, FLOOR CABINET

Self contained blower, cooling and heating coil, filter, humidifier unit for connection to remote compressor or cold water supply, and steam or hot water supply

- ● Air & Refrigeration Corp., New York, N. Y.
- ● Airtemp, Div. of Chrysler Corp., Dayton, O.
- Beacon-Morris Corp., Boston, Mass. (Custom built)
- Betz Engineering Co., Kansas City, Mo.
- Carrier Corp., Syracuse, N. Y.
- ● Clarage Fan Co., Kalamazoo, Mich.
- ● Curtis Refrigerating Machine Co., St. Louis, Mo.
- General Electric Co., Air Conditioning and Commercial Refrigeration Divisions, Bloomfield, N. J.
- General Refrigeration Div., Yates-American Machine Co., Beloit, Wis.
- Hastings Air Conditioning Co., Hastings, Neb.
- ● Ilg Electric Ventilating Co., Chicago, Ill.
- Jaden Mfg. Co., Inc., F., Hastings, Neb.
- Kauffman Air Conditioning Corp., St. Louis, Mo.
- Kelvinator Div., Nash-Kelvinator Corp., Detroit, Mich.
- ● Kennard, Inc., Sam, St. Louis, Mo.
- ● Kramer Trenton Co., Trenton, N. J.
- McQuay, Inc., Minneapolis, Minn.
- ● Nelson Corp., Herman, Moline, Ill.
- Peerless of America, Inc., Chicago, Ill.
- Refrigeration Economics Co., Inc., Canton, O.
- Semco Mfg. Co., Nashville, Tenn.
- Standard Computing Scale Co., The, Air Conditioning and Refrigeration Div., Detroit, Mich.
- ● Trane Co., The, La Crosse, Wis.
- Unified Air Conditioner Co., Duluth, Minn.
- York Corp., York, Pa.
- ● Young Radiator Co., Racine, Wis.

UNITS, WINDOW VENTILATOR AND FILTER

- Airgard Mfg. Co., Chicago, Ill.
- American Air Conditioning Co., Detroit, Mich.
- Automatic Ventilator Co., Corunna, Mich.
- Berger Mfg. Div., Republic Steel Corp., Canton, O.
- Davies Air Filter Corp., New York, N. Y.
- Gale Products, Galesburg, Ill.
- ● Ilg Electric Ventilating Co., Chicago, Ill.
- Kaiser Co., H. S., Chicago, Ill.
- Kauffman Air Conditioning Corp., St. Louis, Mo.
- Mellish & Murray Co., Chicago, Ill.
- National Engineering & Mfg. Co., Kansas City, Mo.
- Reed Unit-Fans, Inc., New Orleans, La.
- Reliable Sheet Metal Engineering Co., Chicago, Ill.
- Somers, Inc., H. J., Detroit, Mich.
- Trade-Wind Motorfans, Inc., Los Angeles, Calif.
- Unified Air Conditioner Co., Duluth, Minn.
- Utility Fan Corp., Los Angeles, Calif.
- Vita-Screen Ventilator Co., New York, N. Y.

UNIVERSAL JOINTS

See Joints, Universal, for Operating Valves

VACUUM GAGES

See Gages, Indicating, Vacuum

VACUUM HEATING SYSTEMS

See Systems, Heating, Vacuum

VACUUM PUMPS

See Pumps, Vacuum

VACUUM RECORDERS

See Recorders, Pressure and Vacuum

VALVE OPERATORS

See Operators, Valve

VALVE RESEATERS

See Reseaters, Valve

VALVES, ANGLE

- Albright Equipment Co., Johnstown, Pa.
- Alloy Steel Products Co., Linden, N. J. (Stainless steel)
- ● American Brass Co., Waterbury, Conn.
- Belfield Co., H., Philadelphia, Pa.
- Belknap Mfg. Co., Bridgeport, Conn.
- Bordo Co., Inc., L. J., Glenside, Pa. (Plug)
- Capitol Brass Works, Div. of Bohn Aluminum & Brass Corp., Detroit, Mich.
- Central Brass Mfg. Co., Cleveland, O.

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Chapman Valve Mfg. Co., The, Indian Orchard, Mass.
Chase Brass & Copper Co., Waterbury, Conn.
Cochrane Corp., Philadelphia, Pa.
● Crane Co., Chicago, Ill.
Detroit Brass & Malleable Wks., Detroit, Mich.
Edward Valve & Mfg. Co., Inc., East Chicago, Ind.
Fairbanks Co., New York, N. Y.
Gorton Heating Corp., Cranford, N. J.
● Grinnell Co., Inc., Providence, R. I.
Hancock Valve Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn.
Hasco Valve & Machine Co., Milwaukee, Wis.
Homestead Valve Mfg. Co., Coraopolis, Pa.
Imperial Brass Mfg. Co., Chicago, Ill.
Jarecki Mfg. Co., Erie, Pa.
● Jenkins Bros., New York, N. Y.
● Kennedy Valve Mfg. Co., Elmira, N. Y.
Klingerit, Inc., New York, N. Y.
Lunkenheimer Co., Cincinnati, O.
Luzerne Rubber Co., Trenton, N. J. (Hard rubber)
Milwaukee Valve Co., Milwaukee, Wis.
Mueller Brass Co., Port Huron, Mich.
Northern Indiana Brass Co., Elkhart, Ind.
Ohio Brass Co., Mansfield, O.
Ohio Injector Co., Wadsworth, O.
Ohio Pattern Wks. & Foundry Co., Cincinnati, O.
O'Malley Valve Co., Edward, Chicago, Ill.
Parker Appliance Co., Cleveland, O.
Pierce Butler Radiator Corp., Syracuse, N. Y.
Pittsburgh Valve & Fittings Corp., Barberton, O.
Powell Co., Wm., Cincinnati, O.
● Reading-Pratt & Cady Div., American Chain & Cable Co., Inc., Reading, Pa.
● Sarcotherm Controls, Inc., Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.
Stockham Pipe Fittings Co., Birmingham, Ala.
Strong, Carlisle & Hammond Co., Cleveland, O.
Vogt Machine Co., Henry, Louisville, Ky.
● Walworth Co., New York, N. Y.
White Flo-Matic Corp., Hoosick Falls, N. Y.
Williams Valve Co., D. T., Cincinnati, O.

VALVES, BALANCING, RADIATOR, FOR FORCED HOT WATER HEATING SYSTEMS

American Radiator & Standard Sanitary Corp., Pittsburgh, Pa.
● Bell & Gossett Co., Morton Grove, Ill.
● Detroit Lubricator Co., Detroit, Mich.
Hammond Brass Works, Hammond, Ind.
Marsh Valve Co., Dunkirk, N. Y.
● Sarcotherm Controls, Inc., Chicago, Ill.

VALVES, BLOW-OFF

Alloy Steel Products Co., Linden, N. J. (Stainless steel)
Babcock & Wilcox Co., New York, N. Y.
Barrett Machine Co., N. S. Pittsburgh, Pa.
Bordo Co., Inc., L. J., Glenside, Pa.
Cash Valve Mfg. Co., A. W., Decatur, Ill.
Chapman Valve Mfg. Co., The, Indian Orchard, Mass.
Cochrane Corp., Philadelphia, Pa.
● Crane Co., Chicago, Ill.
Eclipse Fuel Engineering Co., Rockford, Ill.
Edward Valve & Mfg. Co., Inc., East Chicago, Ind.
Elliott Co., Jeannette, Pa.
Everlasting Valve Co., Jersey City, N. J.
Fairbanks Co., New York, N. Y.
Hancock Valve Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn.
Homestead Valve Mfg. Co., Coraopolis, Pa.
Jarecki Mfg. Co., Erie, Pa.
● Jenkins Bros., New York, N. Y.
Keckley Co., O. C., Chicago, Ill.
Ludlow Valve Mfg. Co., Inc., Troy, N. Y.
Lunkenheimer Co., Cincinnati, O.
● McDonnell & Miller, Chicago, Ill.
Norgren Co., C. A., Denver, Colo.
Ohio Injector Co., Wadsworth, O.
O'Malley Valve Co., Edward, Chicago, Ill.
Parker Appliance Co., Cleveland, O.
Permutit Co., New York, N. Y.
Powell Co., Wm., Cincinnati, O.
Strong, Carlisle & Hammond Co., Cleveland, O.
● Walworth Co., New York, N. Y.
● Yarnall-Waring Co., Philadelphia, Pa.

VALVES, CHECK

Albright Equipment Co., Johnstown, Pa.
Alloy Steel Products Co., Linden, N. J. (Stainless steel)
American Hard Rubber Co., New York, N. Y. (Hard rubber)
Barrett, Haentjens & Co., Hazleton, Pa.
Belfield Co., H., Philadelphia, Pa.
Belknap Mfg. Co., Bridgeport, Conn.
Capitol Brass Works, Div. of Bohn Aluminum & Brass Corp., Detroit, Mich.
Catawissa Valve & Fittings Co., Catawissa, Pa.
Chapman Valve Mfg. Co., The, Indian Orchard, Mass.
Chase Brass & Copper Co., Waterbury, Conn.
Cochrane Corp., Philadelphia, Pa.
Cooper Co., Clark, Palmyra, N. J.
● Crane Co., Chicago, Ill.
Darling Valve & Mfg. Co., Williamsport, Pa.
Detroit Brass & Malleable Wks., Detroit, Mich.
Durabla Mfg. Co., New York, N. Y.
Eclipse Fuel Engineering Co., Rockford, Ill.
Eddy Valve Co., Waterford, N. Y.
Edward Valve & Mfg. Co., Inc., East Chicago, Ind.
Fairbanks Co., New York, N. Y.
● Flori Pipe Co., The, St. Louis, Mo.
Foster Engineering Co., Newark, N. J.
Golden-Anderson Valve Specialty Co., Pittsburgh, Pa.
● Grinnell Co., Inc., Providence, R. I.
Hammond Brass Works, Hammond, Ind.
Hancock Valve Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn.
Hasco Valve & Machine Co., Milwaukee, Wis.
Imperial Brass Mfg. Co., Chicago, Ill.
Jarecki Mfg. Co., Erie, Pa.
● Jenkins Bros., New York, N. Y.
● Kennedy Valve Mfg. Co., Elmira, N. Y.
Locke Regulator Co., Salem, Mass.
Ludlow Valve Mfg. Co., Inc., Troy, N. Y.
Lunkenheimer Co., Cincinnati, O.
Luzerne Rubber Co., Trenton, N. J. (Hard rubber)
Milwaukee Valve Co., Milwaukee, Wis.
Mueller Co., Decatur, Ill.
Mueller Brass Co., Port Huron, Mich.
Norgren Co., C. A., Denver, Colo.
Northern Indiana Brass Co., Elkhart, Ind.
Ohio Brass Co., Mansfield, O.
Ohio Injector Co., Wadsworth, O.
Ohio Pattern Wks. & Foundry Co., Cincinnati, O.
O'Malley Valve Co., Edward, Chicago, Ill.
Parker Appliance Co., Cleveland, O.
Pittsburgh Valve & Fittings Corp., Barberton, O.
Powell Co., Wm., Cincinnati, O.
Preferred Utilities Co., Inc., New York, N. Y.
● Reading-Pratt & Cady Div., American Chain & Cable Co., Inc., Reading, Pa.
Rensselaer Valve Co., Cohoes, N. Y.
Ruggles-Klingemann Mfg. Co., Salem, Mass. (Bleeder type)
Schutte & Koerting Co., Philadelphia, Pa.
Smolensky Valve Co., Inc., Cleveland, O.
Stockham Pipe Fittings Co., Birmingham, Ala.
Stokes Rubber Co., Jos., Trenton, N. J. (Hard rubber)
Strong, Carlisle & Hammond Co., Cleveland, O.
Taco Heaters, Inc., New York, N. Y.
Vogt Machine Co., Henry, Louisville, Ky.
● Walworth Co., New York, N. Y.
Watson-Stillman Co., Roselle, N. J. (Hydraulic service)
White Flo-Matic Corp., Hoosick Falls, N. Y.
Williams Gauge Co., Pittsburgh, Pa. (Noiseless)
Williams Valve Co., D. T., Cincinnati, O.

VALVES, COMPRESSOR

Cash Valve Mfg. Co., A. W., Decatur, Ill.
Durabla Mfg. Co., New York, N. Y.
Frick Co., Waynesboro, Pa.
Imperial Brass Mfg. Co., Chicago, Ill.
Kerotest Mfg. Co., Pittsburgh, Pa.
Lunkenheimer Co., Cincinnati, O.
Ohio Injector Co., Wadsworth, O.
Voss Co., J. H. H., New York, N. Y.

VALVES, DIAPHRAGM

American Hard Rubber Co., New York, N. Y. (Rubber lined)
American Schaeffer & Budenberg Instrument Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn.
Atlas Valve Co., Inc., Newark, N. J.
Belfield Co., H., Philadelphia, Pa.
Black-Sivalls & Bryson, Inc., Kansas City, Mo.
Boylston Steam Specialty Co., Chicago, Ill.
Bristol Co., Waterbury, Conn.
● Cash Co., A. W., Decatur, Ill.
Cash Valve Mfg. Co., A. W., Decatur, Ill.
Chaplin-Fulton Mfg. Co., Pittsburgh, Pa.
Cooper Co., Clark, Palmyra, N. J.
Davis Regulator Co., Chicago, Ill.
Defender Automatic Regulator Co., St. Louis, Mo.
Eclipse Fuel Engineering Co., Rockford, Ill.
● Fisher Governor Co., Marshalltown, Ia.
Foster Engineering Co., Newark, N. J.
Foxboro Co., Foxboro, Mass.
Friez Instrument Div., Bendix Aviation Corp., Towson, Md.
● General Controls Co., Glendale, Calif.
Golden-Anderson Valve Specialty Co., Pittsburgh, Pa.
● Grinnell Co., Providence, R. I.
Hagan Corp., Pittsburgh, Pa.
Hanlon-Waters, Inc., Tulsa, Okla.
● Henry Valve Co., Chicago, Ill.
● Illinois Engineering Co., Chicago, Ill.
● Johnson Service Co., Milwaukee, Wis.
Kainer & Co., Chicago, Ill.
● Kieley & Mueller, Inc., North Bergen, N. J.
Klipfel Mfg. Co., Chicago, Ill.
Kunkle Valve Co., Ft. Wayne, Ind.
Locke Regulator Co., Salem, Mass.
Mason-Neilan Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.

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• Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
Mueller Brass Co., Port Huron, Mich.
Mueller Co., Decatur, Ill.
Mueller Steam Specialty Co., Inc., Long Island City, N. Y.
Norgren Co., C. A., Denver, Colo.
Northern Indiana Brass Co., Elkhart, Ind.
Parks-Cramer Co., Fitchburg, Mass.
Powell Co., Wm., Cincinnati, O.
• Powers Regulator Co., Chicago, Ill.
• Reading-Pratt & Cady Div., American Chain & Cable Co., Inc., Reading, Pa.
Ruggles-Klingemann Mfg. Co., Salem, Mass.
Schade Valve Mfg. Co., Philadelphia, Pa.
Schutte & Koerting Co., Philadelphia, Pa.
Spence Engineering Co., Inc., Walden, N. Y.
Spencer Thermostat Co., Attleboro, Mass.
Staples & Pfeiffer, Ltd., San Francisco, Calif.
Strong, Carlisle & Hammond Co., Cleveland, O.
Swartwout Co., Cleveland, O.
Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
Taylor Instrument Companies, Rochester, N. Y.
• Trane Co., The, La Crosse, Wis.
Trerice Co., H. O., Detroit, Mich.
Triplex Heating Specialty Co., Peru, Ind.
Watson & McDaniel Co., Philadelphia, Pa.
Watts Regulator Co., Lawrence, Mass.
• White-Rodgers Electric Co., St. Louis, Mo.

VALVES, FIRE PROTECTION, SPRINKLER SYSTEM CONTROL

• Barber-Colman Co., Rockford, Ill.
Everlasting Valve Co., Jersey City, N. J.
Fairbanks Co., New York, N. Y.
Hodgman Mfg. Co., Taunton, Mass.
Ohio Injector Co., Wadsworth, O.
Raisler Corp., Grimes Sprinkler Div., New York, N. Y.
• Reading-Pratt & Cady Div., American Chain & Cable Co., Inc., Reading, Pa.
Rockwood Sprinkler Co., Worcester, Mass.
Ross Sprinkler Co., Pasadena, Calif.

VALVES, FLOAT

Albright Equipment Co., Johnstown, Pa.
• Alco Valve Co., St. Louis, Mo.
American Hard Rubber Co., New York, N. Y. (Hard rubber)
Atlas Valve Co., Inc., Newark, N. J.
• Automatic Products Co., Milwaukee, Wis. (Oil)
Belfield Co., H., Philadelphia, Pa.
Boylston Steam Specialty Co., Chicago, Ill.
Caldwell Co., W. E., Louisville, Ky.
• Cash Co., A. W., Decatur, Ill.
Central Brass Mfg. Co., Cleveland, O.
Cochrane Corp., Philadelphia, Pa.
Cooper Co., Clark, Palmyra, N. J.
• Crane Co., Chicago, Ill.
Darling Valve & Mfg. Co., Williamsport, Pa.
Davis Regulator Co., Chicago, Ill.
Defender Automatic Regulator Co., St. Louis, Mo.
Eclipse Fuel Engineering Co., Rockford, Ill.
Eddy Valve Co., Waterford, N. Y.
• Fisher Governor Co., Marshalltown, Ia.
Foster Engineering Co., Newark, N. J.
Frick Co., Waynesboro, Pa.
Golden-Anderson Valve Specialty Co., Pittsburgh, Pa.
Hanlon-Waters, Inc., Tulsa, Okla.
• Illinois Engineering Co., Chicago, Ill.
Imperial Brass Mfg. Co., Chicago, Ill.
Keckley Co., O. C., Chicago, Ill.
• Kieley & Mueller, Inc., North Bergen, N. J.
Klipfel Mfg. Co., Chicago, Ill.
Locke Regulator Co., Salem, Mass.
Ludlow Valve Mfg. Co., Inc., Troy, N. Y.
Luzerne Rubber Co., Trenton, N. J. (Hard rubber)
• Maid-O'-Mist, Inc., Chicago, Ill.
Mason-Neilan Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
• McDonnell & Miller, Chicago, Ill.
Monash-Younker Co., Chicago, Ill.
Monmouth Products Co., Cleveland, O.
Mueller Steam Specialty Co., Inc., Long Island City, N. Y.
Phillips & Co., H. A., Chicago, Ill.
• Reading-Pratt & Cady Div., American Chain & Cable Co., Inc., Reading, Pa.
Ross Valve Mfg. Co., Inc., Troy, N. Y.
Ruggles-Klingemann Mfg. Co., Salem, Mass.
Schade Valve Mfg. Co., Philadelphia, Pa.
Schaub Engineering Co., Fred H., Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.
Spence Engineering Co., Inc., Walden, N. Y.
Stickle Steam Specialties Co., Indianapolis, Ind.
Swartwout Co., Cleveland, O.
• Trane Co., The, La Crosse, Wis.
Viking Air Conditioning Corp., Cleveland, O.
Voss Co., J. H. H., New York, N. Y.
Watts Regulator Co., Lawrence, Mass.

VALVES, FLOW CONTROL, FOR HOT WATER HEATING SYSTEMS

• Bell & Gossett Co., Morton Grove, Ill.
• Illinois Engineering Co., Chicago, Ill.
Kainer & Co., Chicago, Ill.
Kehm Corp., The, Chicago, Ill.
• Sarcotherm Controls, Inc., Chicago, Ill.
Taco Heaters, Inc., New York, N. Y.
• Thrush & Co., H. A., Peru, Ind.
• Trane Co., The, La Crosse, Wis.
Triplex Heating Specialty Co., Peru, Ind.

VALVES, FORGED STEEL

Albright Equipment Co., Johnstown, Pa.
Catawissa Valve & Fittings Co., Catawissa, Pa.
Chapman Valve Mfg. Co., The, Indian Orchard, Mass.
Cochrane Corp., Philadelphia, Pa.
• Crane Co., Chicago, Ill.
Darling Valve & Mfg. Co., Williamsport, Pa.
Edward Valve & Mfg. Co., Inc., East Chicago, Ind.
• Flori Pipe Co., The, St. Louis, Mo.
Hancock Valve Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn.
• Henry Valve Co., Chicago, Ill.
O'Malley Valve Co., Edward, Chicago, Ill.
Parker Appliance Co., Cleveland, O.
Schutte & Koerting Co., Philadelphia, Pa.
Steel Improvement & Forge Co., Cleveland, O.
Strong, Carlisle & Hammond Co., Cleveland, O.
Vogt Machine Co., Henry, Louisville, Ky.
• Walworth Co., New York, N. Y.
Watson-Stillman Co., Roselle, N. J.

VALVES, GATE, BRASS AND BRONZE

• American Brass Co., Waterbury, Conn.
Belknap Mfg. Co., Bridgeport, Conn.
Bordo Co., Inc., L. J., Glenside, Pa.
Capitol Brass Works, Div. of Bohn Aluminum Brass Corp., Detroit, Mich.
Chapman Valve Mfg. Co., The, Indian Orchard, Mass.
Chase Brass & Copper Co., Waterbury, Conn.
Conklin Brass & Copper Co., Inc., T. E., New York, N. Y.
Cooper Co., Clark, Palmyra, N. J.
• Crane Co., Chicago, Ill.
Darling Valve & Mfg. Co., Williamsport, Pa.
Detroit Brass & Malleable Wks., Detroit, Mich.
Eddy Valve Co., Waterford, N. Y.
Everlasting Valve Co., Jersey City, N. J.
Fairbanks Co., New York, N. Y.
• Flori Pipe Co., The, St. Louis, Mo.
Hammond Brass Wks., Hammond, Ind.
Hancock Valve Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn.
• Hoffman Specialty Co., Indianapolis, Ind.
Jarecki Mfg. Co., Erie, Pa.
• Jenkins Bros., New York, N. Y.
• Kennedy Valve Mfg. Co., Elmira, N. Y.
Ludlow Valve Mfg. Co., Inc., Troy, N. Y.
Lunkenheimer Co., Cincinnati, O.
Milwaukee Valve Co., Milwaukee, Wis.
Northern Indiana Brass Co., Elkhart, Ind.
Ohio Brass Co., Mansfield, O.
Ohio Injector Co., Wadsworth, O.
Ohio Pattern Wks. & Foundry Co., Cincinnati, O.
Pittsburgh Valve & Fittings Corp., Barberton, O.
Powell Co., Wm., Cincinnati, O.
• R-S Products Corp., Philadelphia, Pa.
• Reading-Pratt & Cady Div., American Chain & Cable Co., Inc., Reading, Pa.
Rensselaer Valve Co., Cohoes, N. Y.
Scott Valve Mfg. Co., Detroit, Mich.
Stockham Pipe Fittings Co., Birmingham, Ala.
• Walworth Co., New York, N. Y.
Williams Valve Co., D. T., Cincinnati, O.

VALVES, GATE, IRON BODY

Bordo Co., Inc., L. J., Glenside, Pa.
Chapman Valve Mfg. Co., The, Indian Orchard, Mass.
Cooper Co., Clark, Palmyra, N. J.
• Crane Co., Chicago, Ill.
Darling Valve & Mfg. Co., Williamsport, Pa.
Eclipse Fuel Engineering Co., Rockford, Ill.
Eddy Valve Co., Waterford, N. Y.
Everlasting Valve Co., Jersey City, N. J.
Fairbanks Co., New York, N. Y.
• Flori Pipe Co., The, St. Louis, Mo.
Hancock Valve Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn.
Illinois Malleable Iron Co., Chicago, Ill.
Jarecki Mfg. Co., Erie, Pa.
• Jenkins Bros., New York, N. Y.
• Kennedy Valve Mfg. Co., Elmira, N. Y.
Ludlow Valve Mfg. Co., Inc., Troy, N. Y.
Lunkenheimer Co., Cincinnati, O.
Milwaukee Valve Co., Milwaukee, Wis.
Ohio Injector Co., Wadsworth, O.

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Pittsburgh Valve & Fittings Co., Barberton, O.
Powell Co., Wm., Cincinnati, O.
● R-S Products Corp., Philadelphia, Pa.
● Reading-Pratt & Cady Div., American Chain & Cable Co., Inc., Reading, Pa.
Rensselaer Valve Co., Cohoes, N. Y.
Scott Valve Mfg. Co., Detroit, Mich.
Semet-Solvay Engineering Corp., New York, N. Y.
● Walworth Co., New York, N. Y.
Williams Valve Co., D. T., Cincinnati, O.

VALVES, GATE, STEEL

Alloy Steel Products Co., Linden, N. J. (Stainless steel)
American Hard Rubber Co., New York, N. Y.
Bordo Co., Inc., L. J., Glenside, Pa.
Central Brass Mfg. Co., Cleveland, O.
Chapman Valve Mfg. Co., The, Indian Orchard, Mass.
Colonial Alloys Co., Metals Div., Philadelphia, Pa. (Stainless)
Cooper Alloy Foundry Co., Hillside, N. J.
Cooper Co., Clark, Palmyra, N. J.
● Crane Co., Chicago, Ill.
Darling Valve & Mfg. Co., Williamsport, Pa.
Everlasting Valve Co., Jersey City, N. J.
● Flori Pipe Co., The, St. Louis, Mo.
Hancock Valve Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn.
Hasco Valve & Machine Co., Milwaukee, Wis.
● Jenkins Bros., New York, N. Y.
Ludlow Valve Mfg. Co., Inc., Troy, N. Y.
Lunkenheimer Co., Cincinnati, O.
National Radiator Co., The, Johnstown, Pa.
Ohio Injector Co., Wadsworth, O.
Powell Co., Wm., Cincinnati, O.
● R-S Products Corp., Philadelphia, Pa.
● Reading-Pratt & Cady Div., American Chain & Cable Co., Inc., Reading, Pa.
Vogt Machine Co., Henry, Louisville, Ky.
● Walworth Co., New York, N. Y.

VALVES, GLOBE, BRASS AND BRONZE

● American Brass Co., Waterbury, Conn.
Automatic Temperature Control Co., Inc., Philadelphia, Pa.
Belfield Co., H., Philadelphia, Pa.
Belknap Mfg. Co., Bridgeport, Conn.
Capitol Brass Works, Div. of Bohn Aluminum & Brass Corp., Detroit, Mich.
Central Valve Mfg. Co., Chicago, Ill.
Chapman Valve Mfg. Co., The, Indian Orchard, Mass.
Chase Brass & Copper Co., Waterbury, Conn.
Conklin Brass & Copper Co., Inc., T. E., New York, N. Y.
Cooper Co., Clark, Palmyra, N. J.
● Crane Co., Chicago, Ill.
Detroit Brass & Malleable Wks., Detroit, Mich.
Fairbanks Co., New York, N. Y.
● Flori Pipe Co., The, St. Louis, Mo.
● Grinnell Co., Inc., Providence, R. I.
Hammond Brass Wks., Hammond, Ind.
Hancock Valve Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn.
● Hoffman Specialty Co., Indianapolis, Ind.
Jarecki Mfg. Co., Erie, Pa.
● Jenkins Bros., New York, N. Y.
● Kennedy Valve Mfg. Co., Elmira, N. Y.
Klingerit, Inc., New York, N. Y.
Lunkenheimer Co., Cincinnati, O.
Milwaukee Valve Co., Milwaukee, Wis.
Newman Brothers, Inc., Cincinnati, O.
Northern Indiana Brass Co., Elkhart, Ind.
Ohio Brass Co., Mansfield, O.
Ohio Injector Co., Wadsworth, O.
Ohio Pattern Wks. & Foundry Co., Cincinnati, O.
O'Malley Valve Co., Edward, Chicago, Ill.
Ostlind Valve, Inc., Portland, Ore.
Pittsburgh Valve & Fittings Corp., Barberton, O.
Powell Co., Wm., Cincinnati, O.
● Reading-Pratt & Cady Div., American Chain & Cable Co., Inc., Reading, Pa.
Scott Valve Mfg. Co., Detroit, Mich.
Stockham Pipe Fittings Co., Birmingham, Ala.
Strong, Carlisle & Hammond Co., Cleveland, O.
● Walworth Co., New York, N. Y.
Watson-Stillman Co., Roselle, N. Y. (Hydraulic service)
White Flo-Matic Corp., Hoosick Falls, N. Y.
Williams Valve Co., D. T., Cincinnati, O.

VALVES, GLOBE, IRON BODY

Automatic Temperature Control Co., Inc., Philadelphia, Pa.
Belfield Co., H., Philadelphia, Pa.
Chapman Valve Mfg. Co., The, Indian Orchard, Mass.
Cooper Co., Clark, Palmyra, N. J.
● Crane Co., Chicago, Ill.
Cyrus Shank Co., Chicago, Ill.
Edward Valve & Mfg. Co., Inc., East Chicago, Ind.
Fairbanks Co., New York, N. Y.
● Flori Pipe Co., The, St. Louis, Mo.
Hancock Valve Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn.
Jarecki Mfg. Co., Erie, Pa.
● Jenkins Bros., New York, N. Y.
● Kennedy Valve Mfg. Co., Elmira, N. Y.
Klingerit, Inc., New York, N. Y.
Ludlow Valve Mfg. Co., Inc., Troy, N. Y.
Lunkenheimer Co., Cincinnati, O.
Ohio Injector Co., Wadsworth, O.
Pittsburgh Valve & Fittings Corp., Barberton, O.
Powell Co., Wm., Cincinnati, O.
● Reading-Pratt & Cady Div., American Chain & Cable Co., Inc., Reading, Pa.
Scott Valve Mfg. Co., Detroit, Mich.
Shank Co., Cyrus, Chicago, Ill.
● Walworth Co., New York, N. Y.
Williams Valve Co., D. T., Cincinnati, O.

VALVES, GLOBE, STEEL

Alloy Steel Products Co., Linden, N. J. (Stainless steel)
Automatic Temperature Control Co., Inc., Philadelphia, Pa.
Belfield Co., H., Philadelphia, Pa.
Chapman Valve Mfg. Co., The, Indian Orchard, Mass.
Colonial Alloys Co., Metals Div., Philadelphia, Pa. (Stainless)
Cooper Alloy Foundry Co., Hillside, N. J.
Cooper Co., Clark, Palmyra, N. J.
● Crane Co., Chicago, Ill.
Edward Valve & Mfg. Co., Inc., East Chicago, Ind.
● Flori Pipe Co., The, St. Louis, Mo.
Hancock Valve Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn.
Hasco Valve & Machine Co., Milwaukee, Wis.
Jarecki Mfg. Co., Erie, Pa.
● Jenkins Bros., New York, N. Y.
Klingerit, Inc., New York, N. Y.
Ludlow Valve Mfg. Co., Inc., Troy, N. Y.
Lunkenheimer Co., Cincinnati, O.
Ohio Injector Co., Wadsworth, O.
Ostlind Valve, Inc., Portland, Ore.
Parker Appliance Co., Cleveland, O.
Powell Co., Wm., Cincinnati, O.
● Reading-Pratt & Cady Div., American Chain & Cable Co., Inc., Reading, Pa.
Schutte & Koerting Co., Philadelphia, Pa.
Strong, Carlisle & Hammond Co., Cleveland, O.
Vogt Machine Co., Henry, Louisville, Ky.
● Walworth Co., New York, N. Y.
Watson-Stillman Co., Roselle, N. J.

VALVES, LINED

American Hard Rubber Co., New York, N. Y. (Hard rubber lined)
● American Smelting & Refining Co., New York, N. Y.
Chapman Valve Mfg. Co., The, Indian Orchard, Mass.
Goodrich Co., B. F., Akron, O. (Rubber lined)
Hasco Valve & Machine Co., Milwaukee, Wis. (Rubber)
Lead Lined Iron Pipe Co., Wakefield, Mass. (Lead or tin)
McAlear Mfg. Co., Chicago, Ill.
National Lead Co., New York, N.Y. (Lead)
Northern Indiana Brass Co., Elkhart, Ind. (Tinned)
Resisto Pipe & Valve Co., East Cambridge, Mass. (Lead)
Schutte & Koerting Co., Philadelphia, Pa. (Lead)
United States Stoneware Co., New York, N. Y.

VALVES, MIXING, HOT AND COLD WATER

Boiler Room Equipment, Inc., New York, N. Y.
Dole Valve Co., The, Chicago, Ill.
● Fulton Sylphon Co., Knoxville, Tenn.
General Fittings Co., Providence, R. I.
Klipfel Mfg. Co., Chicago, Ill.
Lawler Automatic Controls, Mount Vernon, N. Y.
McAlear Mfg. Co., Chicago, Ill.
● Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
● Sarco Co., Inc., New York, N. Y.
● Sarcotherm Controls, Inc., Chicago, Ill.
Thermo-Mix, Inc., Long Island City, N. Y.

VALVES, MIXING, STEAM AND WATER

Central Brass Mfg. Co., Cleveland, O.
Cooper Co., Clark, Palmyra, N. J.
● Fulton Sylphon Co., Knoxville, Tenn.
General Fittings Co., Providence, R. I.
● Johnson Service Co., Milwaukee, Wis.
Leonard Valve Co., Providence, R. I.
● Powers Regulator Co., Chicago, Ill.
● Sarco Co., Inc., New York, N. Y.
● Sarcotherm Controls, Inc., Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.
Vapor Car Heating Co., Inc., Chicago, Ill.

VALVES, MOTOR OPERATED

● Alco Valve Co., St. Louis, Mo.
Armstrong Heat Control Co., Portland, Ore.
Au-Temp-Co Corp., New York, N. Y.
Automatic Temperature Control Co., Inc., Philadelphia, Pa.
● Barber-Colman Co., Rockford, Ill.
● Bell & Gossett Co., Morton Grove, Ill.
Bristol Co., Waterbury, Conn.
Chapman Valve Mfg. Co., The, Indian Orchard, Mass.
Cochrane Corp., Philadelphia, Pa.
Cooper Co., Clark, Palmyra, N. J.

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- ● Crane Co., Chicago, Ill.
- Cutler-Hammer, Inc., Milwaukee, Wis.
- Darling Valve & Mfg. Co., Williamsport, Pa.
- Davis Regulator Co., Chicago, Ill.
- Eddy Valve Co., Waterford, N. Y.
- Edward Valve & Mfg. Co., Inc., East Chicago, Ind.
- Fairbanks Co., New York, N. Y.
- Foxboro Co., Foxboro, Mass.
- ● General Controls Co., Glendale, Calif.
  Electric Co., Schenectady, N. Y.
- Hanlon-Waters, Inc., Tulsa, Okla.
- Hasco Valve & Machine Co., Milwaukee, Wis.
- Homestead Valve Mfg. Co., Coraopolis, Pa.
- ● Illinois Engineering Co., Chicago, Ill.
- ● Jenkins Bros., New York, N. Y.
- ● Kennedy Valve Mfg. Co., Elmira, N. Y.
- ● Kieley & Mueller, Inc., North Bergen, N. J.
- Ludlow Valve Mfg. Co., Inc., Troy, N. Y.
- Lunkenheimer Co., Cincinnati, O.
- Mason-Neilan Regulator Co., Boston, Mass.
- ● Mercoid Corp., Chicago, Ill.
- Merco-Nordstrom Valve Co., Pittsburgh, Pa.
- ● Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
- Permutit Co., New York, N. Y.
- Philadelphia Gear Works, Inc., Philadelphia, Pa.
- Powell Co., Wm., Cincinnati, O.
- Preferred Utilities Co., Inc., New York, N. Y.
- ● R-S Products Corp., Philadelphia, Pa.
- ● Reading-Pratt & Cady Div., American Chain & Cable Co., Inc., Reading, Pa.
- Ruggles-Klingemann Mfg. Co., Salem, Mass.
- ● Sarcotherm Controls, Inc., Chicago, Ill.
- Schutte & Koerting Co., Philadelphia, Pa.
- Shallcross Controls, Inc., Milwaukee, Wis.
- Tallmadge & Co., Webster, East Orange, N. J.
- Taylor Instrument Companies, Rochester, N. Y.
- Trerice Co., H. O., Detroit, Mich.
- Vapor Car Heating Co., Inc., Chicago, Ill.
- Vogt Machine Co., Henry, Louisville, Ky.
- ● Walworth Co., New York, N. Y.
- ● Webster & Co., Warren, Camden, N. J.
- Webster Tallmadge & Co., East Orange, N. J.

VALVES, NEEDLE

- Air-O-Line Co., The, Dallas, Tex.
- Alloy Steel Products Co., Linden, N. J. (Stainless steel)
- ● Automatic Products Co., Milwaukee, Wis. (Oil)
- Chapman Valve Mfg. Co., The, Indian Orchard, Mass.
- ● Crane Co., Chicago, Ill.
- Cyrus Shank Co., Chicago, Ill.
- Darling Valve & Mfg. Co., Williamsport, Pa.
- Detroit Brass & Malleable Wks., Detroit, Mich.
- ● Detroit Lubricator Co., Detroit, Mich.
- Edward Valve & Mfg. Co., Inc., East Chicago, Ind.
- ● Flori Pipe Co., The, St. Louis, Mo.
- Grove Regulator Co., Oakland, Calif.
- Hancock Valve Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn.
- Hanlon-Waters, Inc., Tulsa, Okla.
- Imperial Brass Mfg. Co., Chicago, Ill.
- Jarecki Mfg. Co., Erie, Pa.
- ● Jenkins Bros., New York, N. Y.
- ● Kennedy Valve Mfg. Co., Elmira, N. Y.
- Lunkenheimer Co., Cincinnati, O.
- ● Maid-O'-Mist, Inc., Chicago, Ill.
- ● McDonnell & Miller, Chicago, Ill.
- Milwaukee Valve Co., Milwaukee, Wis.
- Norgren Co., C. A., Denver, Colo.
- Ohio Brass Co., Mansfield, O.
- Ohio Injector Co., Wadsworth, O.
- Parker Appliance Co., Cleveland, O.
- Powell Co., Wm., Cincinnati, O.
- ● Reading-Pratt & Cady Div., American Chain & Cable Co., Inc., Reading, Pa.
- Schaub Engineering Co., Fred H., Chicago, Ill.
- Shank Co., Cyrus, Chicago, Ill.
- Taylor Instrument Companies, Rochester, N. Y.
- ● Walworth Co., New York, N. Y.
- Watson-Stillman Co., Roselle, N. J. (Hydraulic service)
- Williams Valve Co., D. T., Cincinnati, O.

VALVES, PLASTIC

- Haveg Corp., Newark, Del.

VALVES, PLUG

- American Car & Foundry Co., New York, N. Y.
- Barrett, Haentjens & Co., Hazleton, Pa.
- Barrett Machine Co., N. S. Pittsburgh, Pa.
- Bordo Co., Inc., L. J., Glenside, Pa.
- Chapman Valve Mfg. Co., The, Indian Orchard, Mass.
- ● Crane Co., Chicago, Ill.
- Duriron Co., Inc., Dayton, O. (Acid resisting)
- Eddy Valve Co., Waterford, N. Y.
- Edward Valve & Mfg. Co., Inc., East Chicago, Ind.
- Fairbanks Co., New York, N. Y.
- Golden-Anderson Valve Specialty Co., Pittsburgh, Pa.
- Hasco Valve & Machine Co., Milwaukee, Wis.
- Homestead Valve Mfg. Co., Coraopolis, Pa.
- Inner-Tite Clamp Corp., Elizabeth, N. J.
- ● Jenkins Bros., New York, N. Y.
- ● Kennedy Valve Mfg. Co., Elmira, N. Y.
- Klingerit, Inc., New York, N. Y.
- Knight, Maurice A., Akron, O. (Stoneware)
- Lunkenheimer Co., Cincinnati, O.
- Luzerne Rubber Co., Trenton, N. J. (Hard rubber)
- Merco-Nordstrom Valve Co., Pittsburgh, Pa. (Lubricated)
- Mueller Co., Decatur, Ill.
- Northern Indiana Brass Co., Elkhart, Ind.
- Ohio Injector Co., Wadsworth, O.
- O'Malley Valve Co., Edward, Chicago, Ill.
- Pittsburgh Brass Mfg. Co., Pittsburgh, Pa.
- Pittsburgh Valve & Fittings Corp., Barberton, O.
- Powell Co., Wm., Cincinnati, O.
- ● Reading-Pratt & Cady Div., American Chain & Cable Co., Inc., Reading, Pa.
- Stockham Pipe Fittings Co., Birmingham, Ala.
- Taylor Instrument Companies, Rochester, N. Y.
- ● Walworth Co., New York, N. Y.
- White Flo-Matic Corp., Hoosick Falls, N. Y.
- Williams Valve Co., D. T., Cincinnati, O.

VALVES, PRESSURE REDUCING AND REGULATING, AIR AND GAS

- Atlas Valve Co., Inc., Newark, N. J.
- Belfield Co., H., Philadelphia, Pa.
- Black-Sivalls & Bryson, Inc., Kansas City, Mo.
- Boylston Steam Specialty Co., Chicago, Ill.
- ● Cash Co., A. W., Decatur, Ill.
- Cash Valve Mfg. Co., A. W., Decatur, Ill.
- Central Brass Mfg. Co., Cleveland, O.
- Chaplin-Fulton Mfg. Co., Pittsburgh, Pa.
- Cooper Co., Clark, Palmyra, N. J.
- ● Crane Co., Chicago, Ill.
- Davis Regulator Co., Chicago, Ill.
- Defender Automatic Regulator Co., St. Louis, Mo.
- Eclipse Fuel Engineering Co., Rockford, Ill.
- ● Fisher Governor Co., Marshalltown, Ia.
- Foster Engineering Co., Newark, N. J.
- ● Fulton Sylphon Co., Knoxville, Tenn.
- ● General Controls Co., Glendale, Calif.
- Golden-Anderson Valve Specialty Co., Pittsburgh, Pa.
- Grove Regulator Co., Oakland, Calif.
- Hagan Corp., Pittsburgh, Pa.
- Hanlon-Waters, Inc., Tulsa, Okla.
- Hubbell Corp., Chicago, Ill.
- ● Illinois Engineering Co., Chicago, Ill.
- Keckley Co., O. C., Chicago, Ill.
- ● Kieley & Mueller, Inc., North Bergen, N. J.
- Klipfel Mfg. Co., Chicago, Ill.
- Leslie Co., Lyndhurst, N. J.
- Locke Regulator Co., Salem, Mass.
- Mason-Neilan Regulator Co., Boston, Mass.
- McAlear Mfg. Co., Chicago, Ill.
- Modern Engineering Co., St. Louis, Mo.
- Mueller Co., Decatur, Ill.
- Mueller Steam Specialty Co., Inc., Long Island City, N. Y.
- Norgren Co., C. A., Denver, Colo.
- Northern Equipment Co., Erie, Pa.
- ● Powers Regulator Co., Chicago, Ill.
- ● Reading-Pratt & Cady Div., American Chain & Cable Co., Inc., Reading, Pa.
- Roberts-Gordon Appliance Corp., Buffalo, N. Y.
- Ross Valve Mfg. Co., Inc., Troy, N. Y.
- Schade Valve Mfg. Co., Philadelphia, Pa.
- Schutte & Koerting Co., Philadelphia, Pa.
- Shallcross Controls, Inc., Milwaukee, Wis.
- Spence Engineering Co., Inc., Walden, N. Y.
- Squires Co., C. E., Cleveland, O.
- Staples & Pfeiffer, Ltd., San Francisco, Calif.
- Strong, Carlisle & Hammond Co., Cleveland, O.
- Sullivan Valve & Engineering Co., Butte, Mont.
- Swartwout Co., Cleveland, O.
- Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
- Tallmadge & Co., Webster, East Orange, N. J.
- Taylor Instrument Companies, Rochester, N. Y.
- ● Thrush & Co., H. A., Peru, Ind.
- Trerice Co., H. O., Detroit, Mich.
- Triplex Heating Specialty Co., Peru, Ind.
- Tryco Products, Inc., Westfield, Mass.
- Voss Co., J. H. H., New York, N. Y.
- Watson & McDaniel Co., Philadelphia, Pa.
- Watts Regulator Co., Lawrence, Mass.
- Webster Tallmadge & Co., East Orange, N. J.
- White Flo-Matic Corp., Hoosick Falls, N. Y.

VALVES, PRESSURE REDUCING AND REGULATING, HOT WATER

- ● Bell & Gossett Co., Morton Grove, Ill.
- ● Cash Co., A. W., Decatur, Ill.
- Cash Valve Mfg. Co., A. W., Decatur, Ill.
- Chaplin-Fulton Mfg. Co., Pittsburgh, Pa.
- ● Crane Co., Chicago, Ill.
- Defender Automatic Regulator Co., St. Louis, Mo.
- ● Fisher Governor Co., Marshalltown, Ia.
- Foster Engineering Co., Newark, N. J.
- Hanlon-Waters, Inc., Tulsa, Okla.

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● Illinois Engineering Co., Chicago, Ill.
Kainer & Co., Chicago, Ill.
Keckley Co., O. C., Chicago, Ill.
● Kieley & Mueller, Inc., North Bergen, N. J.
Klipfel Mfg. Co., Chicago, Ill.
Leslie Co., Lyndhurst, N. J.
McAlear Mfg. Co., Chicago, Ill.
Mueller Co., Decatur, Ill.
Mueller Steam Specialty Co., Inc., Long Island City, N. Y.
● Reading-Pratt & Cady Div., American Chain & Cable Co., Inc., Reading, Pa.
Republic Flow Meters Co., Chicago, Ill.
● Sarcotherm Controls, Inc., Chicago, Ill.
Schade Valve Mfg. Co., Philadelphia, Pa.
Spence Engineering Co., Inc., Walden, N. Y.
Stickle Steam Specialties Co., Indianapolis, Ind.
Strong, Carlisle & Hammond Co., Cleveland, O.
Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
Taylor Instrument Companies, Rochester, N. Y.
● Thrush & Co., H. A., Peru, Ind.
● Trane Co., The, La Crosse, Wis.
Trerice Co., H. O., Detroit, Mich.
Watson & McDaniel Co., Philadelphia, Pa.
Watts Regulator Co., Lawrence, Mass.

VALVES, PRESSURE REDUCING AND REGULATING, STEAM

All-Vac Steam Control System, Chicago, Ill.
● American District Steam Co., North Tonawanda, N. Y.
Atlas Valve Co., Inc., Newark, N. J.
Bailey Meter Co., Cleveland, O.
Belfield Co., H., Philadelphia, Pa.
Boylston Steam Specialty Co., Chicago, Ill.
● Cash Co., A. W., Decatur, Ill.
Cash Valve Mfg. Co., A. W., Decatur, Ill.
Central Brass Mfg. Co., Cleveland, O.
Chaplin-Fulton Mfg. Co., Pittsburgh, Pa.
● Crane Co., Chicago, Ill.
Davis Regulator Co., Chicago, Ill.
Defender Automatic Regulator Co., St. Louis, Mo.
● Dunham Co., C. A., Chicago, Ill.
Eclipse Fuel Engineering Co., Rockford, Ill.
● Fisher Governor Co., Marshalltown, Ia.
Foster Engineering Co., Newark, N. J.
● Fulton Sylphon Co., The, Knoxville, Tenn.
Golden-Anderson Valve Specialty Co., Pittsburgh, Pa.
Grove Regulator Co., Oakland, Calif.
Hagan Corp., Pittsburgh, Pa.
Hanlon-Waters, Inc., Tulsa, Okla.
Hubbell Corp., Chicago, Ill.
● Illinois Engineering Co., Chicago, Ill.
Keckley Co., O. C., Chicago, Ill.
● Kieley & Mueller, Inc., North Bergen, N. J.
Klipfel Mfg. Co., Chicago, Ill.
Leslie Co., Lynhurst, N. J.
Locke Regulator Co., Salem, Mass.
Mason-Neilan Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Mueller Co., Decatur, Ill.
Mueller Steam Specialty Co., Inc., Long Island City, N. Y.
Northern Equipment Co., Erie, Pa.
● Powers Regulator Co., Chicago, Ill.
● Reading-Pratt & Cady Div., American Chain & Cable Co., Inc., Reading, Pa.
Republic Flow Meters Co., Chicago, Ill.
Ross Valve Mfg. Co., Inc., Troy, N. Y.
Ruggles-Klingemann Mfg. Co., Salem, Mass.
● Sarcotherm Controls, Inc., Chicago, Ill.
Schade Valve Mfg. Co., Philadelphia, Pa.
Schutte & Koerting Co., Philadelphia, Pa.
Shallcross Controls, Inc., Milwaukee, Wis.
Spence Engineering Co., Inc., Walden, N. Y.
Squires Co., C. E., Cleveland, O.
Staples & Pfeiffer, Ltd., San Francisco, Calif.
Stickle Steam Specialties Co., Indianapolis, Ind.
Strong, Carlisle & Hammond Co., Cleveland, O.
Swartwout Co., Cleveland, O.
Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
Tallmadge & Co., Webster, East Orange, N. J.
Taylor Instrument Companies, Rochester, N. Y.
Trerice Co., H. O., Detroit, Mich.
Triplex Heating Specialty Co., Peru, Ind.
Vapor Car Heating Co., Inc., Chicago, Ill.
Watson & McDaniel Co., Philadelphia, Pa.
Watts Regulator Co., Lawrence, Mass.
Webster Tallmadge & Co., East Orange, N. J.
White Flo-Matic Corp., Hoosick Falls, N. Y.

VALVES, PUMP

Anchor Packing Co., Philadelphia, Pa.
Berger Bros. Co., Philadelphia, Pa.
Durabla Mfg. Co., New York, N. Y.
● Jenkins Bros., New York, N. Y.
Quaker Rubber Corp., Philadelphia, Pa.

VALVES, RADIATOR, AIR

American Radiator & Standard Sanitary Corp., Pittsburgh, Pa.
Anderson Products, Inc., Cambridge, Mass.
Beaton & Cadwell Mfg. Co., New Britain, Conn.
Beaton & Corbin Mfg. Co., Southington, Conn.
Bridgeport Brass Co., Bridgeport, Conn.
● Burnham Boiler Corp., Irvington, N. Y.
Chicago Specialty Mfg. Co., Chicago, Ill.
● Crane Co., Chicago, Ill.
● Detroit Lubricator Co., Detroit, Mich.
Dole Valve Co., The, Chicago, Ill.
Gorton Heating Corp., Cranford, N. J.
● Hoffman Specialty Co., Indianapolis, Ind.
Jarecki Mfg. Co., Erie, Pa.
● Jenkins Bros, New York, N. Y.
Keeney Mfg. Co., Newington, Conn.
Little Mfg. Co., M. S., Hartford, Conn.
● Maid-O'-Mist, Inc., Chicago, Ill. (Humidifying)
Marsh Corp., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
National Metal Products Corp., Chicago, Ill.
New York Air Valve Corp., New York, N. Y.
Slater Mfg. Co., Wakefield, Mass.
Sullivan Valve & Engineering Co., Butte, Mont.
● Trane Co., The, LaCrosse, Wis.

VALVES, RADIATOR, AUTOMATIC TEMPERATURE CONTROL, ELECTRIC

Au-Temp-Co Corp., New York, N. Y.
● Barber-Colman Co., Rockford, Ill.
Electric Valve Mfg. Co., Inc., New York, N. Y.
● Fulton Sylphon Co., Knoxville, Tenn.
● Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
● Sarcotherm Controls, Inc., Chicago, Ill.
Vapor Car Heating Co., Inc., Chicago, Ill.

VALVES, RADIATOR, AUTOMATIC TEMPERATURE CONTROL, PNEUMATIC

American Schaeffer & Budenburg Instrument Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn.
● Johnson Service Co., Milwaukee, Wis.
● Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
● Powers Regulator Co., Chicago, Ill.

VALVES, RADIATOR, AUTOMATIC TEMPERATURE CONTROL, SELF-CONTAINED

American Radiator & Standard Sanitary Corp., Pittsburgh, Pa.
American Schaeffer & Budenburg Instrument Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn.
Au-Temp-Co Corp., New York, N. Y.
● Edison, Inc., Thos. A., Instrument Div., West Orange, N. J.
● Fulton Sylphon Co., Knoxville, Tenn.
Lawler Automatic Controls, Mount Vernon, N. Y.
● Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
● Powers Regulator Co., Chicago, Ill.
● Sterling, Inc., Milwaukee, Wis.
Tallmadge & Co., Webster, East Orange, N. J.
● Trane Co., The, LaCrosse, Wis.
Webster Tallmadge & Co., East Orange, N. J.

VALVES, RADIATOR, ORIFICE

● American District Steam Co., North Tonawanda, N. Y.
American Radiator & Standard Sanitary Corp., Pittsburgh, Pa.
Au-Temp-Co Corp., New York, N. Y.
Barnes & Jones, Inc., Boston, Mass.
● Detroit Lubricator Co., Detroit, Mich.
● Dunham Co., C. A., Chicago, Ill.
● Grinnell Co., Inc., Providence, R. I.
● Haines & Co., William S., Philadelphia, Pa.
● Hoffman Specialty Co., Indianapolis, Ind.
● Illinois Engineering Co., Chicago, Ill.
Marsh Valve Co., Dunkirk, N. Y.
New York Air Valve Corp., New York, N. Y.
● Sarco Co., Inc., New York, N. Y.
● Sarcotherm Controls, Inc., Chicago, Ill.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
● Trane Co., The, LaCrosse, Wis.
● Webster & Co., Warren, Camden, N. J.

VALVES, RADIATOR, STEAM AND HOT WATER, HAND

American Radiator & Standard Sanitary Corp., Pittsburgh, Pa.
Belfield Co., H., Philadelphia, Pa.
Belknap Mfg. Co., Bridgeport, Conn.
Bishop & Babcock Mfg. Co., Cleveland, O.
● Burnham Boiler Corp., Irvington, N. Y.
Capitol Brass Works, Div. of Bohn Aluminum & Brass Corp., Detroit, Mich.
Chase Brass & Copper Co., Waterbury, Conn.
● Crane Co., Chicago, Ill.
Detroit Brass & Malleable Wks., Detroit, Mich.
● Detroit Lubricator Co., Detroit, Mich.
● Dunham Co., C. A., Chicago, Ill.
Fairbanks Co., New York, N. Y.
Gorton Heating Corp., Cranford, N. J.
● Grinnell Co., Inc., Providence, R. I.
● Haines & Co., William S., Philadelphia, Pa.
Hammond Brass Wks., Hammond, Ind.
● Hoffman Specialty Co., Indianapolis, Ind.
● Illinois Engineering Co., Chicago, Ill.
Jarecki Mfg. Co., Erie, Pa.

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● Jenkins Bros., New York, N. Y.
● Kennedy Valve Mfg. Co., Elmira, N. Y.
Lunkenheimer Co., Cincinnati, O.
Marsh Corp., Jas. P., Chicago, Ill.
Marsh Valve Co., Dunkirk, N. Y.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Northern Indiana Brass Co., Elkhart, Ind.
Ohio Brass Co., Mansfield, O.
Ohio Injector Co., Wadsworth, O.
Pierce Butler Radiator Corp., Syracuse, N. Y.
Powell Co., Wm., Cincinnati, O.
● Reading-Pratt & Cady Div., American Chain & Cable Co., Inc., Reading, Pa.
● Sarco Co., Inc., New York, N. Y.
Scott Valve Mfg. Co., Detroit, Mich.
● Sterling, Inc., Milwaukee, Wis.
● Trane Co., The, LaCrosse, Wis.
● Walworth Co., New York, N. Y.
● Webster & Co., Warren, Camden, N. J.
Williams Valve Co., D. T., Cincinnati, O.

VALVES, RADIATOR, STEAM AND HOT WATER, MODULATING

● American District Steam Co., North Tonawanda, N. Y.
American Radiator & Standard Sanitary Corp., Pittsburgh, Pa.
Barnes & Jones, Inc., Boston, Mass.
Bishop & Babcock Mfg. Co., Cleveland, O.
Cashin Co., W. D., Boston, Mass.
● Crane Co., Chicago, Ill.
Cryer Trap & Valve Co., Inc., New York, N. Y.
● Detroit Lubricator Co., Detroit, Mich.
● Dunham Co., C. A., Chicago, Ill.
● Fulton Sylphon Co., Knoxville, Tenn.
Gorton Heating Corp., Cranford, N. J.
● Haines & Co., William S., Philadelphia, Pa.
● Hoffman Specialty Co., Indianapolis, Ind.
● Illinois Engineering Co., Chicago, Ill.
Marsh Corp., Jas. P., Chicago, Ill.
Marsh Valve Co., Dunkirk, N. Y.
McAlear Mfg. Co., Chicago, Ill.
● Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
Mouat Vapor Heating Co., The, Cleveland, O.
Ohio Brass Co., Mansfield, O.
Pierce Butler Radiator Corp., Syracuse, N. Y.
● Sarco Co., Inc., New York, N. Y.
● Sarcotherm Controls, Inc., Chicago, Ill.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
● Sterling, Inc., Milwaukee, Wis.
Tallmadge & Co., Webster, East Orange, N. J.
● Trane Co., The, LaCrosse, Wis.
Vapor Specialty Co., New York, N. Y.
● Webster & Co., Warren, Camden, N. J.
Webster Tallmadge & Co., East Orange, N. J.

VALVES, REFRIGERATION (ANGLE, CHECK, GATE, GLOBE, NEEDLE, RELIEF)

Ashton Valve Co., Cambridge, Mass.
● Baker Ice Machine Co., Inc., Omaha, Neb.
Black-Sivalls & Bryson, Inc., Kansas City, Mo.
Central Brass Mfg. Co., Cleveland, O.
● Crane Co., Chicago, Ill.
Cyrus Shank Co., Chicago, Ill.
Dersch, Gesswein & Neuert, Inc., Chicago, Ill.
● Detroit Stamping Co., Detroit, Mich.
● Flori Pipe Co., The, St. Louis, Mo.
Frick Co., Waynesboro, Pa.
● Henry Valve Co., Chicago, Ill.
Imperial Brass Mfg. Co., Chicago, Ill.
● Jenkins Bros., New York, N. Y.
Kerotest Mfg. Co., Pittsburgh, Pa.
Lunkenheimer Co., Cincinnati, O.
Mueller Brass Co., Port Huron, Mich.
Peerless of America, Inc., Chicago, Ill.
Pierce Butler Radiator Corp., Syracuse, N. Y.
Reynolds Mfg. Co., Inc., Springfield, Mo.
Shank Co., Cyrus, Chicago, Ill.
Superior Valve and Fittings Co., Pittsburgh, Pa.
Triumph Ice Machine Co., Cincinnati, O.
Vilter Mfg. Co., Milwaukee, Wis.
Vogt Machine Co., Henry, Louisville, Ky.
● Walworth Co., New York, N. Y.
Weatherhead Co., Cleveland, O.
● Worthington Pump & Machinery Corp., Air Conditioning and Refrigeration Div., Harrison, N. J.
X L Refrigerating Co., Chicago, Ill.
York Corp., York, Pa.

VALVES, REFRIGERATION, BACK PRESSURE

● Alco Valve Co., St. Louis, Mo.
Burrows Mfg. Co., F. A., York, Pa.
● Cash Co., A. W., Decatur, Ill.
Dersch, Gesswein & Neuert, Inc., Chicago, Ill.
Electrimatic Div., The, of the Simoniz Co., Chicago, Ill.
● Fisher Governor Co., Marshalltown, Ia.
Foster Engineering Co., Newark, N. J.
Frigidaire Div., General Motors Corp., Dayton, O.
Hubbell Corp., Chicago, Ill.
Imperial Brass Mfg. Co., Chicago, Ill.
Mueller Brass Co., Port Huron, Mich.
Temprite Products Corp., Detroit, Mich.
Vilter Mfg. Co., Milwaukee, Wis.
X L Refrigerating Co., Chicago, Ill.
York Corp., York, Pa.

VALVES, REFRIGERATION, EXPANSION, CONSTANT PRESSURE

● Alco Valve Co., St. Louis, Mo.
American Injector Co., Detroit, Mich.
● Automatic Products Co., Milwaukee, Wis.
● Baker Ice Machine Co., Inc., Omaha, Neb.
● Cash Co., A. W., Decatur, Ill.
Consolidated Safety Valve Div., Manning, Maxwell & Moore Inc., Bridgeport, Conn.
● Detroit Lubricator Co., Detroit, Mich.
Foster Engineering Co., Newark, N. J.
Frigidaire Div., General Motors Corp., Dayton, O.
Hubbell Corp., Chicago, Ill.
Mayson Mfg. Co., Inc., Detroit, Mich.
Milwaukee Gas Specialty Co., Milwaukee, Wis.
Peerless of America, Inc., Chicago, Ill.
Vilter Mfg. Co., Milwaukee, Wis.
X L Refrigerating Co., Chicago, Ill.

VALVES, REFRIGERATION, EXPANSION, THERMOSTATIC

● Alco Valve Co., St. Louis, Mo.
American Injector Co., Detroit, Mich.
● Automatic Products Co., Milwaukee, Wis.
● Detroit Lubricator Co., Detroit, Mich.
Frigidaire Div., General Motors Corp., Dayton, O.
● General Controls Co., Glendale, Calif.
Larkin Coils, Inc., Atlanta, Ga.
Mayson Mfg. Co., Inc., Detroit, Mich.
Milwaukee Gas Specialty Co., Milwaukee, Wis.
Peerless of America, Inc., Chicago, Ill.
● Spoehrer-Lange Co., St. Louis, Mo.
X L Refrigerating Co., Chicago, Ill.

VALVES, REFRIGERATION, FLOAT, HIGH PRESSURE

● Alco Valve Co., St. Louis, Mo.
American Injector Co., Detroit, Mich.
Foster Engineering Co., Newark, N. J.
Frick Co., Waynesboro, Pa.
Hubbell Corp., Chicago, Ill.
Imperial Brass Mfg. Co., Chicago, Ill.
● Kieley & Mueller, Inc., North Bergen, N. J.
● Mercoid Corp., Chicago, Ill.
Phillips & Co., H. A., Chicago, Ill.
Schaub Engineering Co., Fred H., Chicago, Ill.
Strong, Carlisle & Hammond Co., Cleveland, O.
Temprite Products Corp., Detroit, Mich.
Vilter Mfg. Co., Milwaukee, Wis.
Voss Co., J. H. H., New York, N. Y.
Weatherhead Co., Cleveland, O.
● Worthington Pump & Machinery Corp., Air Conditioning and Refrigeration Div., Harrison, N. J.
X L Refrigerating Co., Chicago, Ill.
York Corp., York, Pa.

VALVES, REFRIGERATION, MAGNETIC STOP

● Alco Valve Co., St. Louis, Mo.
● Automatic Products Co., Milwaukee, Wis.
Automatic Switch Co., New York, N. Y.
● Detroit Lubricator Co., Detroit, Mich.
Electric Valve Mfg. Co., Inc., New York, N. Y.
Electrimatic Div., The, of the Simoniz Co., Chicago, Ill.
Frick Co., Waynesboro, Pa.
● General Controls Co., Glendale, Calif.
Hubbell Corp., Chicago, Ill.
● Mercoid Corp., Chicago, Ill.
● Penn Electric Switch Co., Goshen, Ind.

VALVES, REFRIGERATION, WATER REGULATING, PRESSURE OR TEMPERATURE ACTUATED

American Injector Co., Detroit, Mich.
Art Valve Co., Chicago, Ill.
● Automatic Products Co., Milwaukee, Wis.
● Cash Co., A. W., Decatur, Ill.
Cyrus Shank Co., Chicago, Ill.
Electrimatic Div., The, of the Simoniz Co., Chicago, Ill.
Foster Engineering Co., Newark, N. J.
Frigidaire Div., General Motors Corp., Dayton, O.
● Kieley & Mueller, Inc., North Bergen, N. J.
● Mercoid Corp., Chicago, Ill.
Mueller Co., Decatur, Ill.
● Penn Electric Switch Co., Goshen, Ind.
Perfection Refrigeration Parts Co., Harvey, Ill.
Phillips & Co., H. A., Chicago, Ill.
● Sarco Co., Inc., New York, N. Y.
Shank Co., Cyrus, Chicago, Ill.
Spence Engineering Co., Inc., Walden, N. Y.
Tagliabue Mfg. Co., Brooklyn, N. Y.

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VALVES, RELIEF, HOT WATER, COMBINED PRESSURE AND TEMPERATURE OPERATED

- Beaton & Cadwell Mfg. Co., New Britain, Conn.
- Carpenter & Paterson, Inc., East Boston, Mass.
- Cash Valve Mfg. Co., A. W., Decatur, Ill.
- ● Crane Co., Chicago, Ill.
- Kainer & Co., Chicago, Ill.
- Mueller Co., Decatur, Ill.
- Patrol Valve Co., The, Cleveland, O.
- Spencer Thermostat Co., Attleboro, Mass.
- ● Thrush & Co., H. A., Peru, Ind.
- ● Trane Co., The, La Crosse, Wis.
- Watts Regulator Co., Lawrence, Mass.

VALVES, RELIEF, HOT WATER, PRESSURE OPERATED

- Ashton Valve Co., Cambridge, Mass.
- Beaton & Cadwell Mfg. Co., New Britain, Conn.
- ● Bell & Gossett Co., Morton Grove, Ill.
- Black-Sivalls & Bryson, Inc., Kansas City, Mo.
- Boylston Steam Specialty Co., Chicago, Ill.
- Carpenter & Paterson, Inc., East Boston, Mass.
- ● Cash Co., A. W., Decatur, Ill.
- Cash Valve Mfg. Co., A. W., Decatur, Ill.
- Consolidated Safety Valve Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn.
- ● Crane Co., Chicago, Ill.
- Davis Regulator Co., Chicago, Ill.
- Eddy Valve Co., Waterford, N. Y.
- Edward Valve & Mfg. Co., Inc., East Chicago, Ind.
- ● Fisher Governor Co., Marshalltown, Ia.
- Golden-Anderson Valve Specialty Co., Pittsburgh, Pa.
- Kainer & Co., Chicago, Ill.
- Kehm Corp., The, Chicago, Ill.
- ● Kieley & Mueller, Inc., North Bergen, N. J.
- Klipfel Mfg. Co., Chicago, Ill.
- Kunkle Valve Co., Ft. Wayne, Ind.
- Locke Regulator Co., Salem, Mass.
- Lonergan Co., J. E., Philadelphia, Pa.
- Lunkenheimer Co., Cincinnati, O.
- ● Maid-O'-Mist, Inc., Chicago, Ill.
- McAlear Mfg. Co., Chicago, Ill.
- ● McDonnell & Miller, Chicago, Ill.
- Milwaukee Valve Co., Milwaukee, Wis.
- Monarch Mfg. Works, Inc., Philadelphia, Pa.
- Mueller Co., Decatur, Ill.
- Mueller Steam Specialty Co., Inc., Long Island City, N. Y.
- Neptune Meter Co., New York, N. Y.
- Parker Appliance Co., The, Cleveland, O.
- Patrol Valve Co., The, Cleveland, O.
- Penberthy Injector Co., Detroit, Mich.
- ● Reading-Pratt & Cady Div., American Chain & Cable Co., Inc., Reading, Pa.
- Ross Valve Mfg. Co., Inc., Troy, N. Y.
- Schade Valve Mfg. Co., Philadelphia, Pa.
- Spencer Thermostat Co., Attleboro, Mass.
- Staples & Pfeiffer, Ltd., San Francisco, Calif.
- Swartwout Co., Cleveland, O.
- Taco Heaters, Inc., New York, N. Y.
- Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
- ● Thrush & Co., H. A., Peru, Ind.
- Triplex Heating Specialty Co., Peru, Ind.
- Tryco Products, Inc., Westfield, Mass.
- Watson & McDaniel Co., Philadelphia, Pa.
- Watts Regulator Co., Lawrence, Mass.

VALVES, RELIEF, HOT WATER, PRESSURE OPERATED, SELF-FILLING

- Beaton & Cadwell Mfg. Co., New Britain, Conn.
- ● Bell & Gossett Co., Morton Grove, Ill.
- Cash Valve Mfg. Co., A. W., Decatur, Ill.
- ● Crane Co., Chicago, Ill.
- Kehm Corp., The, Chicago, Ill.
- ● Kieley & Mueller, Inc., North Bergen, N. J.
- Mueller Co., Decatur, Ill.
- ● Thrush & Co., H. A., Peru, Ind.
- Watts Regulator Co., Lawrence, Mass.

VALVES, RELIEF, OIL

- Ashton Valve Co., Cambridge, Mass.
- ● Cash Co., A. W., Decatur, Ill.
- Cash Valve Mfg. Co., A. W., Decatur, Ill.
- Consolidated Safety Valve Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn.
- Cooper Co., Clark, Palmyra, N. J.
- ● Fisher Governor Co., Marshalltown, Ia.
- Fulflo Specialties Co., Inc., The, Blanchester, O.
- Keckley Co., O. C., Chicago, Ill.
- ● Kieley & Mueller, Inc., North Bergen, N. J.
- Kunkle Valve Co., Ft. Wayne, Ind.
- Lunkenheimer Co., Cincinnati, O.
- Milwaukee Valve Co., Milwaukee, Wis.
- Watson & McDaniel Co., Philadelphia, Pa.

VALVES, SADDLE

- Fairbanks Co., New York, N. Y.
- Imperial Brass Mfg. Co., Chicago, Ill.
- ● Maid-O'-Mist, Inc., Chicago, Ill.
- Ohio Injector Co., Wadsworth, O.
- ● Walworth Co., New York, N. Y.

VALVES, SAFETY, STEAM

- Ashton Valve Co., Cambridge, Mass.
- Capitol Brass Works, Div. of Bohn Aluminum & Brass Corp., Detroit, Mich.
- Consolidated Safety Valve Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn.
- Foster Engineering Co., Newark, N. J.
- ● Kieley & Mueller, Inc., North Bergen, N. J.
- Kunkle Valve Co., Ft. Wayne, Ind.
- Lonergan Co., J. E., Philadelphia, Pa.
- Lunkenheimer Co., Cincinnati, O.
- ● McDonnell & Miller, Chicago, Ill.
- Scott Valve Mfg. Co., Detroit, Mich.
- ● Walworth Co., New York, N. Y.

VALVES, SOLDER JOINT

- ● American Brass Co., Waterbury, Conn.
- American Radiator & Standard Sanitary Corp., Pittsburgh, Pa
- Chase Brass & Copper Co., Waterbury, Conn.
- ● Crane Co., Chicago, Ill.
- Darling Valve & Mfg. Co., Williamsport, Pa.
- Fairbanks Co., New York, N. Y. (Silver braze joints)
- Hammond Brass Works, Hammond, Ind.
- Imperial Brass Mfg. Co., Chicago, Ill.
- ● Jenkins Bros., New York, N. Y.
- Kerotest Mfg. Co., Pittsburgh, Pa.
- Mueller Brass Co., Port Huron, Mich.
- Northern Indiana Brass Co., Elkhart, Ind.
- Pittsburgh Valve & Fittings Corp., Barberton, O.
- Powell Co., Wm., Cincinnati, O.
- Scott Valve Mfg. Co., Detroit, Mich.
- ● Walworth Co., New York, N. Y. (Brazed)
- Weatherhead Co., Cleveland, O.
- Williams Valve Co., D. T., Cincinnati, O.

VALVES, SOLENOID

- Albright Equipment Co., Johnstown, Pa.
- ● Alco Valve Co., St. Louis, Mo.
- Au-Temp-Co Corp., New York, N. Y.
- ● Automatic Products Co., Milwaukee, Wis.
- Automatic Switch Co., New York, N. Y.
- ● Barber-Colman Co., Rockford, Ill.
- Belfield Co., H., Philadelphia, Pa.
- Cooper Co., Clark, Palmyra, N. J.
- Cutler-Hammer, Inc., Milwaukee, Wis.
- Davis Regulator Co., Chicago, Ill.
- ● Detroit Lubricator Co., Detroit, Mich.
- Electric Valve Mfg. Co., Inc., New York, N. Y.
- Electrimatic Div., The, of the Simoniz Co., Chicago, Ill.
- Frick Co., Waynesboro, Pa.
- ● General Controls Co., Glendale, Calif.
- General Electric Co., Schenectady, N. Y.
- General Sales & Products Co., Cohoes, N. Y.
- Golden-Anderson Valve Specialty Co., Pittsburgh, Pa.
- Hubbell Corp., Chicago, Ill.
- Hunt & Son, C. B., Salem, O.
- Keckley Co., O. C., Chicago, Ill.
- ● McDonnell & Miller, Chicago, Ill.
- ● Mercoid Corp., Chicago, Ill.
- Milwaukee Gas Specialty Co., Milwaukee, Wis.
- ● Minneapolis-Honeywell Regulator Co., Minneapolis, Minn
- Nicholson & Co., W. H., Wilkes-Barre, Pa.
- Payne Furnace & Supply Co., Inc., Beverly Hills, Calif.
- ● Penn Electric Switch Co., Goshen, Ind.
- Pfening Co., Fred D., Columbus, O. (1" water and steam)
- ● R-S Products Corp., Philadelphia, Pa.
- Ruggles-Klingemann Mfg. Co., Salem, Mass.
- ● Sarco Co., Inc., New York, N. Y.
- ● Sarcotherm Controls, Inc., Chicago, Ill.
- ● Spoehrer-Lange Co., St. Louis, Mo.
- Square D Co., Detroit, Mich.
- Supreme Electric Products Corp., Rochester, N. Y.
- Vapor Car Heating Co., Inc., Chicago, Ill.
- Wheelco Instruments Co., Chicago, Ill.
- ● White-Rodgers Electric Co., St. Louis, Mo.

VALVES, 2, 3, AND 4 WAY

- Albright Equipment Co., Johnstown, Pa.
- ● Alco Valve Co., St. Louis, Mo.
- ● American Brass Co., Waterbury, Conn.
- Automatic Temperature Control Co., Inc., Philadelphia, Pa.
- ● Barber-Colman Co., Rockford, Ill.
- Belfield Co., H., Philadelphia, Pa.
- Bordo Co., Inc., Glenside, Pa.
- Bristol Co., Waterbury, Conn.
- ● Cash Co, A. W., Decatur, Ill.
- Cash Valve Mfg. Co., A. W., Decatur, Ill.
- Cooper Co., Clark, Palmyra, N. J.
- ● Crane Co., Chicago, Ill.
- Davis Regulator Co., Chicago, Ill.
- ● Detroit Lubricator Co., Detroit, Mich.
- ● General Controls Co., Glendale, Calif.
- Golden-Anderson Valve Specialty Co., Pittsburgh, Pa.
- Homestead Valve Mfg. Co., Coraopolis, Pa.
- Hunt & Son, C. B., Salem, O.

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Imperial Brass Mfg. Co., Chicago, Ill.
Jarecki Mfg. Co., Erie, Pa.
● Johnson Service Co., Milwaukee, Wis.
Kerotest Mfg. Co., Pittsburgh, Pa.
Lonergan Co., J. E., Philadelphia, Pa.
Lunkenheimer Co., Cincinnati, O.
Luzerne Rubber Co., Trenton, N. J. (Hard rubber)
McAlear Mfg. Co., Chicago, Ill.
● Mercoid Corp., Chicago, Ill.
Merco-Nordstrom Valve Co., Pittsburgh, Pa.
● Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
Mueller Brass Co., Port Huron, Mich.
Nicholson & Co., W. H., Wilkes-Barre, Pa.
Parker Appliance Co., Cleveland, O.
● Penn Electric Switch Co., Goshen, Ind.
Powell Co., Wm., Cincinnati, O.
● Powers Regulator Co., Chicago, Ill.
● R-S Products Corp., Philadelphia, Pa.
Ruggles-Klingemann Mfg. Co., Salem, Mass.
● Sarcotherm Controls, Inc., Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.
Spence Engineering Co., Inc., Walden, N. Y.
Taylor Instrument Companies, Rochester, N. Y.
● Walworth Co., New York, N. Y. (Lubricated plug valves)
Watson-Stillman Co., Roselle, N. J. (Hydraulic service)
Weatherhead Co., Cleveland, O.
Williams Valve Co., D. T., Cincinnati, O.

VANES, DUCT TURNING, PREFABRICATED

● Air Devices, Inc., New York, N. Y.
● Barber-Colman Co., Rockford, Ill.
Stewart Mfg. Co., Orange, N. J. (Outlet scoops)
● Tuttle & Bailey, Inc., New Britain, Conn.
Waterloo Register Co., Waterloo, Ia.

VAPOR HEATING SYSTEMS

See Systems, Heating, Vapor

VARIABLE SPEED DRIVES

See Changers, Speed, Hydraulic Coupling; Changers, Speed, Mechanical; Reducers, Speed; Pulleys and Sheaves, for Belt Drives

VARIABLE SPEED PULLEYS

See Changers, Speed, Mechanical

V-BELT DRIVES

See Drives, V-Belt

VELOCITY REGULATORS

See Regulators, Air Velocity

VENTILATION HEATERS

See Surface, Finned, Heating

VENTILATORS, BLACKOUT

Air Conditioning Products Co., Detroit, Mich.
Carrier Corp., Syracuse, N. Y.
● Chelsea Fan & Blower Co., Inc., Irvington, N. J.
● De Bothezat Ventilating Equipment Div., American Machine & Metals, Inc., East Moline, Ill.
● Trane Co., The, La Crosse, Wis.
● Young Radiator Co., Racine, Wis.

VENTILATORS, MUSHROOM

Aeolus Dickinson, Chicago, Ill.
Best Register Co., Milwaukee, Wis.
● De Bothezat Ventilating Equipment Div., American Machine & Metals, Inc., East Moline, Ill.
Knowles Mushroom Ventilator Co., Montclair, N. J.
● Mueller Furnace Co., L. J., Milwaukee, Wis.
Penn Ventilating Co., Philadelphia, Pa.
Peters-Dalton, Inc., Detroit, Mich.
● Tuttle & Bailey, Inc., New Britain, Conn.
Ventilating Products Co., Chicago, Ill.

VENTILATORS, ROOF, FAN

Aeolus Dickinson, Chicago, Ill.
Air Conditioning Products Co., Detroit, Mich.
Air Controls, Inc., Cleveland, O.
Airmaster Corp., Chicago, Ill.
● Allen Corp., Detroit, Mich.
American Blower Corp., Detroit, Mich.
American Coolair Corp., Jacksonville, Fla.
American-Larson Ventilating Co., Pittsburgh, Pa.
American Steel Band Co., Pittsburgh, Pa.
Arex Co., Chicago, Ill.
Belanger Fan & Blower Co., Detroit, Mich.
Breidert Co., G. C., Los Angeles, Calif.
Burt Mfg. Co., Akron, O.
Century Fan & Ventilator Co., New York, N. Y.
● Chelsea Fan & Blower Co., Irvington, N. J.
Clay Equipment Corp., Cedar Falls, Ia.
Davidson Hy Duty Roof Fan Co., Newton, Mass.
● De Bothezat Ventilating Equipment Div., American Machine & Metals, Inc., New York, N. Y.
Diehl Mfg. Co., Somerville, N. J.
Dual Air Fan Co., Chicago, Ill.
Economy Electric Mfg. Co., Chicago, Ill.
Electrovent Fan & Mfg. Co., Chicago, Ill.
Empire Ventilation Equipment Co., Long Island City, N. Y.
Fingles, Inc., W. A., Baltimore, Md.
Gallaher Co., The, Owatonna, Minn.
Gehri Co., Tacoma, Wash.
Grand Rapids Blow Pipe & Dust Arrester Corp., Grand Rapids, Mich.
Hirschman Co., W. F., Buffalo, N. Y.
Howes-Woods Co., Cambridge, Mass.
● Ilg Electric Ventilating Co., Chicago, Ill.
International Engineering, Inc., Dayton, O.
Iona Ventilator Co., Inc., Philadelphia, Pa.
● Johnson Fan & Blower Corp., Chicago, Ill.
Jordan & Co., Paul R., Indianapolis, Ind.
Kernchen Co., Chicago, Ill.
King Ventilating Co., Owatonna, Minn.
Klauer Mfg. Co., Dubuque, Ia.
Klee Co., Geo. B., Cincinnati, O.
Lohman Co., Wm. J., Irvington, N. J.
Lumm Co., A. H., Toledo, O.
Mellish & Murray Co., Chicago, Ill.
Myers Electric Co., Inc., Pittsburgh, Pa.
New York Blower Co., Chicago, Ill.
Penn Ventilating Co., Philadelphia, Pa.
Peters-Dalton, Inc., Detroit, Mich.
Phoenix Ventilator Co., Inc., Brooklyn, N. Y.
Propellair, Inc., Springfield, O.
Reed Unit-Fans, Inc., New Orleans, La.
Robertson Co., H. H., Pittsburgh, Pa.
Royal Ventilator Co., Philadelphia, Pa.
Schwitzer-Cummins Co., Indianapolis, Ind.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Swartwout Co., Cleveland, O.
Trade-Wind Motorfans, Inc., Los Angeles, Calif.
● Trane Co., The, La Crosse, Wis.
Truflo Fan Co., Harmony, Pa.
Uno Ventilator Co., Cliftondale, Mass.
Utility Fan Corp., Los Angeles, Calif.
Van Noorden Co., E., Boston, Mass.
Viking Air Conditioning Corp., Cleveland, O.
Washburne & Co., E. G., New York, N. Y.
Waverly Heating Supply Co., Boston, Mass.
Western Engineering & Mfg. Co., Los Angeles, Calif.
Wind-Way Fan & Ventilator Co., New Orleans, La.
● Wing Mfg. Co., L. J., New York, N. Y.
Winkler & Sons, Inc., A. E., Milwaukee, Wis.
● Young Radiator Co., Racine, Wis.

VENTILATORS, ROOF, GRAVITY

Accurate Mfg. Works, Chicago, Ill.
Aeolus Dickinson, Chicago, Ill.
Air Control Products, Inc., Coopersville, Mich.
● Air Devices, Inc., New York, N. Y.
● Allen Corp., Detroit, Mich.
American-Larson Ventilating Co., Pittsburgh, Pa.
American Metal Products Co., Fort Worth, Tex.
American Sheet Metal Works, New Orleans, La.
American Steel Band Co., Pittsburgh, Pa.
Ames Co., W. R., San Francisco, Calif.
Arex Co., Chicago, Ill.
Autoforce Ventilating System, Boston, Mass.
Berger Bros. Co., Philadelphia, Pa.
Breidert Co., G. C., Los Angeles, Calif.
Burt Mfg. Co., Akron, O.
Century Fan & Ventilating Co., New York, N. Y.
Chicago Metal Mfg. Co., Chicago, Ill.
Cincinnati Sheet Metal & Roofing Co., Cincinnati, O.
Clay Equipment Corp., Cedar Falls, Ia.
Day Co., The, Minneapolis, Minn.
Edwards Mfg. Co., Inc., Cincinnati, O.
Empire Ventilation Equipment Co., Long Island City, N. Y.
Fingles, Inc., W. A., Baltimore, Md.
Gehri Co., Tacoma, Wash.
Grand Rapids Blow Pipe & Dust Arrester Co., Grand Rapids, Mich.
Hirschmann Co., W. F., Buffalo, N. Y.
Howes-Woods Co., Cambridge, Mass.
International Steel Co., Evansville, Ind.
Iona Ventilator Co., Inc., Philadelphia, Pa.
Iwan Brothers, South Bend, Ind.
Jamar Co., Walker, Duluth, Minn.
Jordan & Co., Paul R., Indianapolis, Ind.
Kernchen Co., Chicago, Ill.
King Ventilating Co., Owatonna, Minn.
Klauer Mfg. Co., Dubuque, Ia.
Kleenaire Corp., Stevens Point, Wis.
La Crosse Steel Roofing & Corrugating Co., La Crosse, Wis.
Lamneck Products, Inc., Middletown, O.
Lee & Son Co., Thomas, Cincinnati, O.
Leslie Welding Co., Chicago, Ill.
Levow, David, New York, N. Y.
Lumm Co., A. H., Toledo, O.
Lyon, Conklin & Co., Inc., Baltimore, Md.
Mellish & Murray Co., Chicago, Ill.
Merchant & Evans Co., Philadelphia, Pa.
Milcor Steel Co., Milwaukee, Wis.
Norman Sheet Metal Mfg. Co., W. F., Nevada, Mo.

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Osborn Co., The, J. M. & L. A., Cleveland, O.
Patten Co., J. V., Sycamore, Ill.
Penn Ventilating Co., Philadelphia, Pa.
Peters-Dalton, Inc., Detroit, Mich.
Phoenix Ventilator Co., Inc., Brooklyn, N. Y.
Pioneer Roofing & Sheet Metal Co., Muskogee, Okla.
Puhl & Hepper Mfg. Co., Inc., St. Louis, Mo.
Riggin Metal Products, Inc., Kankakee, Ill.
Robertson Co., H. H., Pittsburgh, Pa.
Royal Ventilator Co., Philadelphia, Pa.
Ryniker Steel Products Co., Billings, Mont.
St. Paul Corrugating Co., St. Paul, Minn.
Schoedinger, F. O., Columbus, O.
Sheet Metal Mfg. Co., Inc., Brooklyn, N. Y.
Southbridge Roofing Co., Inc., Southbridge, Mass.
Souther Iron Co., E. E., St. Louis, Mo.
Southern States Iron Roofing Co., Savannah, Ga.
Standard Furnace & Supply Co., Omaha, Neb.
Standard Ventilator Co., Lewisburg, Pa.
Steinhorst & Sons, Inc., Emil, Utica, N. Y.
Swartwout Co., Cleveland, O.
Tierney Rotor Ventilator Co., Minneapolis, Minn.
Tiffin Eaves Trough Co., Tiffin, O.
Uno Ventilator Co., Cliftondale, Mass.
Van Noorden Co., E., Boston, Mass.
Walker Jamar Co., Duluth, Minn.
Western Engineering & Mfg. Co., Los Angeles, Calif.
Willis Steel Corp., Galesburg, Ill.
Winkler & Sons, Inc., A. E., Milwaukee, Wis.
York Corrugating Co., York, Pa.

VENTILATORS, UNIT

● Airtherm Mfg. Co., St. Louis, Mo.
● Johnson Fan & Blower Corp., Chicago, Ill.
● Nelson Corp., Herman, Moline, Ill.
● Nesbitt, Inc., John J., Philadelphia, Pa.
New York Blower Co., Chicago, Ill.
Peerless Unit Ventilation Co., Inc., Bridgeport, Conn.
Sturtevant Co., B. F., Boston, Mass.
● Trane Co., The, La Crosse, Wis.

VIBRATION ELIMINATORS

See Bases and Pads, Vibration Isolating; Hose, Metal, for Eliminating Compressor Vibration

VIBRATION ISOLATORS

See Bases and Pads, Vibration Isolating; Hose, Metal, for Eliminating Compressor Vibration

VISCOSIMETERS

American Instrument Co., Silver Spring, Md.
Beckel & Co., Inc., Wm., Philadelphia, Pa.
Brabender Corp., Rochelle Park, N. J.
Brookfield Engineering Laboratories, Sharon, Mass.
Daigger & Co., A., Chicago, Ill.
Eimer & Amend, New York, N. Y.
Fish-Schurman Corp., New York, N. Y.
General Electric Co., Schenectady, N. Y.
Greiner Co., Emil, New York, N. Y.
Humboldt Mfg. Co., Chicago, Ill.
Machlett & Son, E., New York, N. Y.
Mojonnier Brothers Co., Chicago, Ill.
Olsen Testing Machine Co., Tinius, Philadelphia, Pa.
Monarch Mfg. Works, Inc., Philadelphia, Pa.
Precision Scientific Co., Chicago, Ill.
Ruehfel Co., Inc., George, Brooklyn, N. Y.
Scientific Instrument Co., Detroit, Mich.
Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.
Thermal Syndicate, Ltd., The, New York, N. Y.
Thomas Co., Arthur H., Philadelphia, Pa.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Will Corp., Rochester, N. Y.

VISCOUS LIQUID PUMPS

See Pumps, Viscous Liquids

VISES, PIPE

American Pipe Tool Co., Chicago, Ill.
Armstrong Bros. Tool Co., Chicago, Ill.
Armstrong Mfg. Co., Bridgeport, Conn.
Beaver Pipe Tools, Inc., Warren, O. (Sawing—for tubing)
Billings & Spencer Co., Hartford, Conn.
Crown Die & Tool Co., Chicago, Ill.
Desmond-Stephen Mfg. Co., Urbana, O.
Erie Tool Wks., Erie, Pa.
Hollands Mfg. Co., Erie, Pa.
International Nutyp Tool Co., Oswego, N. Y.
Jarecki Mfg. Co., Erie, Pa.
Nye Tool & Machine Co., Chicago, Ill.
Ridge Tool Co., Elyria, O.
Sac Tool Mfg. Co., St. Louis, Mo.
Toledo Pipe Threading Machine Co., Toledo, O.
Trimont Mfg. Co., Roxbury, Mass.
Vanderman Mfg. Co., Willimantic, Conn.
● Williams & Co., J. H., Buffalo, N. Y.
Yost Mfg. Co., Meadville, Pa.

VISE STANDS

See Stands, Pipe Vise

WALL THERMOSTATS

See Thermostats, Room or Wall

WARM AIR FURNACES

See Furnaces, Warm Air.

WASHERS, AIR

● Air & Refrigeration Corp., New York, N. Y.
Airwasher Corp., Lansing, Mich.
American Blower Corp., Detroit, Mich.
Ames Co., W. R., San Francisco, Calif.
Atlas Heating & Ventilating Co., Ltd., San Francisco, Calif.
Ballantyne Co., Omaha, Neb.
Bayley Blower Co., Milwaukee, Wis.
Betz Engineering Co., Kansas City, Mo.
Bishop & Babcock Mfg. Co., Cleveland, O.
Blower Application Co., Milwaukee, Wis.
● Buffalo Forge Co., Buffalo, N. Y.
Centri-Spray Co., Detroit, Mich.
● Clarage Fan Co., Kalamazoo, Mich.
Columbus Heating & Ventilating Co., Columbus, O.
Electrovent Fan & Mfg. Co., Chicago, Ill.
Mellish & Murray Co., Chicago, Ill.
● Murray Mfg. Co., D. J., Wausau, Wis.
New York Blower Co., Chicago, Ill.
Northern Blower Co., Cleveland, O.
Parks-Cramer Co., Fitchburg, Mass.
Peters-Dalton, Inc., Detroit, Mich.
Phillips Cooling Tower Co., Inc., New York, N. Y.
Ross Sprinkler Co., Pasadena, Calif.
Schmieg Industries, Detroit, Mich.
Spray Engineering Co., Somerville, Mass.
Spray-Wheel Air Conditioners, Inc., Denver, Colo.
Strandwitz & Co., Inc., W. J., Camden, N. J.
Sturtevant Co., B. F., Boston, Mass.
Supreme Heater & Ventilating Corp., St. Louis, Mo.
● Trane Co., The, La Crosse, Wis.
● United States Air Conditioning Corp., Minneapolis, Minn.
Utility Fan Corp., Los Angeles, Calif.
Vilter Mfg. Co., Milwaukee, Wis.
Western Blower Co., Seattle, Wash.
York Corp., York, Pa.

WATER CHILLERS

See Chillers, Water, for Air Conditioning and Refrigeration

WATER HEATERS

See Heaters, Indirect, Submerged; Heaters, Water

WATER METERS

See Meters, Water

WATER TREATMENT

See Treatment, Water, to Inhibit Corrosion

WATER VAPOR REFRIGERATION

See Compressors, Refrigerating, Centrifugal; and Compressors, Refrigerating, Steam Jet

WELDERS, ARC

● Air Reduction Sales Co., New York, N. Y.
Allied Weld-Craft, Inc., Indianapolis, Ind.
● Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Borm Mfg. Co., Elgin, Ill.
Commonwealth Electric Welder Mfg. Co., Philadelphia, Pa.
Eisler Engineering Corp., Newark, N. J.
● Electric Arc, Inc., Newark, N. J.
Emerson Electric Mfg. Co., The, St. Louis, Mo.
Ergolyte Mfg. Co., Philadelphia, Pa.
Fern, Ralph, Scranton, Pa.
General Electric Co., Schenectady, N. Y.
General Equipment Co., Wichita, Kans.
Giant Grip Mfg. Co., Oshkosh, Wis.
Hammett Electric Mfg. Co., Kansas City, Mo.
Hampton Electric Mfg. Co., Pittsburgh, Pa.
Harnischfeger Corp., Milwaukee, Wis.
Hercules Electric & Mfg. Co., Inc., Brooklyn, N. Y.
Hobart Bros. Co., Troy, O.
Hollup Corp., Div. of National Cylinder Gas Co., Chicago, Ill.
Ideal Electric & Mfg. Co., Mansfield, O.
Lee Co., K. O., Aberdeen, S. D.
● Lincoln Electric Co., Cleveland, O.
Maple Valley Mfg. Co., Mapleton, Ia.
Marquette Mfg. Co., Minneapolis, Minn.
Miller Electric Mfg. Co., Inc., Appleton, Wis.
Pier Equipment Mfg. Co., Benton Harbor, Mich.
Sight Feed Generator Co., Richmond, Ind.
Smith Welding Equipment Corp., Minneapolis, Minn.
● Star Electric Motor Co., Bloomfield, N. J.
Trindl Products, Ltd., Chicago, Ill.
Una Welding, Inc., Cleveland, O. (Automatic shielded arc welding)

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Universal Power Corp., Cleveland, O.
Welding Apparatus Co., Chicago, Ill.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Will-Weld Mfg. Co., Inc., Omaha, Neb.
Wilson Welder & Metals Co., Inc., New York, N. Y.

WELDERS, SPOT

Acme Electric Welder Co., Los Angeles, Calif.
Agnew Electric Co., Milford, Mich.
Alphil Spot Welding Co., New York, N. Y.
Dyer Welder & Engineering Co., Kansas City, Mo.
Eisler Engineering Corp., Newark, N. J.
● Electric Arc, Inc., Newark, N. J.
Federal Machine & Welder Co., Warren, O.
Mirco Products Co., Chicago, Ill.
Pier Equipment Mfg. Co., Benton Harbor, Mich.
Taylor-Hall Welding Corp., Worcester, Mass.
Taylor-Winfield Corp., Warren, O.
Thomson-Gibb Electric Welding Co., Lynn, Mass.
Universal Power Corp., Cleveland, O.
Weldex, Inc., Detroit, Mich.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

WELDING COMPOUNDS

See Compounds, Welding

WELDING AND CUTTING APPARATUS, OXY-ACETYLENE

● Air Reduction Sales Co., New York, N. Y.
Allied Weld-Craft, Inc., Indianapolis, Ind.
Atlas Welding Accessories Co., Detroit, Mich.
Dockson Corp., Detroit, Mich.
Ergolyte Mfg. Co., Philadelphia, Pa.
Harris Calorific Co., The, Cleveland, O.
Imperial Brass Mfg. Co., Chicago, Ill.
Linde Air Products Co., The, Unit of Union Carbide & Carbon Corp., New York, N. Y.
Liquid Carbonic Corp., The, Chicago, Ill.
Marquette Mfg. Co., Minneapolis, Minn.
Milburn Co., Alexander, Baltimore, Md.
Modern Engineering Co., St. Louis, Mo.
National Cylinder Gas Co., Chicago, Ill.
Oster Mfg. Co., Cleveland, O.
Quickwork Div., Whiting Corp., Harvey, Ill. (Welding positioner)
Ransome Machinery Co., Sub. of Worthington Pump & Machinery Corp., Dunellen, N. J. (Welding positioner)
Smith Welding Equipment Corp., Minneapolis, Minn.
Tempil Corp., New York, N. Y. (Temperature indicators)
Torchweld Equipment Div., National Cylinder Gas Co., Chicago, Ill.
Universal Power Corp., Cleveland, O.
Victor Equipment Co., San Francisco, Calif.
Wall Chemicals Div. of The Liquid Carbonic Corp., Chicago, Ill.

WELDING FUME COLLECTORS

See Exhausters, Welding Fume

WELDING PIPE CLAMPS

See Clamps, Pipe, Welding

WELDING RINGS

See Rings, Welding

WELDING ROD

See Rod, Gas Welding

WHEELS, BLOWER

Advance Aluminum Castings Corp., Chicago, Ill.
Air Controls, Inc., Cleveland, O.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Mfg. Co., Cleveland, O.
Champion Blower & Forge Co., Lancaster, Pa.
● Clarage Fan Co., Kalamazoo, Mich.
Economy Electric Mfg. Co., Chicago, Ill.
Hastings Air Conditioning Co., Hastings, Neb.
Jaden Mfg. Co., Inc., F., Hastings, Neb.
Janette Mfg. Co., Chicago, Ill.
Lau Blower Co., Dayton, O.
Morrison Products, Inc., Cleveland, O.
New York Blower Co., Chicago, Ill.
Palmer's Mfg. Corp., Phoenix, Ariz.
Peerless Electric Co., Warren, O.
Schwitzer-Cummins Co., Indianapolis, Ind.
Sturtevant Co., B. F., Boston, Mass.
Torrington Mfg. Co., Torrington, Conn.
Triangle Mfg. Co., Oshkosh, Wis.
● United States Air Conditioning Corp., Minneapolis, Minn.
Utility Fan Corp., Los Angeles, Calif.
Viking Air Conditioning Corp., Cleveland, O.
Western Blower Co., Seattle, Wash.

WHITE PRINT MACHINES

See Machines, Blue Print and White Print

WINDOW VENTILATOR AND FILTER UNITS

See Units, Window Ventilator and Filter

WINDOWS, HEAT INSULATING

Advance Insulating Co., Pittsburgh, Pa.
Andersen Corp., Bayport, Minn.
Bache, Semon & Co., New York, N. Y.
Chamberlin Metal Weather Strip Co., Detroit, Mich.
Detroit Steel Products Co., Detroit, Mich.
Kane Mfg. Corp., Kane, Pa.
Libbey-Owens Ford Glass Co., Toledo, O.
Mississippi Glass Co., New York, N. Y.
Pittsburgh Plate Glass Co., Pittsburgh, Pa.
Russell Co., F. C., Cleveland, O.
Truscon Steel Co., Youngstown, O.

WOOD PIPE

See Pipe, Wood

WRENCHES, ADJUSTABLE

Billings & Spencer Co., Hartford, Conn.
● Bonney Forge & Tool Works, Allentown, Pa.
Crescent Tool Co., Jamestown, N. Y.
Erie Tool Works, Erie, Pa.
Peck, Stow & Wilcox Co., Southington, Conn.
Snap-On Tools Corp., Kenosha, Wis.
Techtmann Industries, Inc., Milwaukee, Wis.
Trimont Mfg. Co., Boston, Mass.

WRENCHES, OPEN END

Armstrong Bros. Tool Co., Chicago, Ill.
Billings & Spencer Co., Hartford, Conn.
Blackhawk Mfg. Co., Milwaukee, Wis.
● Bonney Forge & Tool Works, Allentown, Pa.
Snap-On Tools Corp., Kenosha, Wis.
Techtmann Industries, Inc., Milwaukee, Wis.
● Williams & Co., J. H., Buffalo, N. Y.

WRENCHES, PIPE

Armstrong Bros. Tool Co., Chicago, Ill.
Bernz Co., Inc., Otto, Rochester, N. Y.
Billings & Spencer Co., Hartford, Conn.
● Bonney Forge & Tool Works, Allentown, Pa.
Erie Tool Works, Erie, Pa.
International Nutyp Tool Co., Oswego, N. Y.
Peck, Stow & Wilcox Co., Southington, Conn.
Ridge Tool Co., Elyria, O.
Snap-On Tools Corp., Kenosha, Wis.
Trimont Mfg. Co., Boston, Mass.
USHCO Mfg. Co., Inc., Buffalo, N. Y.
● Walworth Co., New York, N. Y.

WRENCHES, RATCHET

Armstrong Bros. Tool Co., Chicago, Ill.
Billings & Spencer Co., Hartford, Conn.
Blackhawk Mfg. Co., Milwaukee, Wis.
● Bonney Forge & Tool Works, Allentown, Pa.
Dresser Mfg. Co., Bradford, Pa.
Greene, Tweed & Co., New York, N. Y.
Lowell Wrench Co., Worcester, Mass.
Snap-On Tools Corp., Kenosha, Wis.
● Williams & Co., J. H., Buffalo, N. Y.

WRENCHES, SOCKET

Armstrong Bros. Tool Co., Chicago, Ill.
Billings & Spencer Co., Hartford, Conn.
Blackhawk Mfg. Co., Milwaukee, Wis.
● Bonney Forge & Tool Works, Allentown, Pa.
Chicago Pneumatic Tool Co., New York, N. Y. (pneumatic)
Lowell Wrench Co., Worcester, Mass.
Snap-On Tools Corp., Kenosha, Wis.
● Williams & Co., J. H., Buffalo, N. Y.

WRENCHES, TORQUE INDICATING

Automotive Maintenance Machinery Co., North Chicago, Ill.
Blackhawk Mfg. Co., Milwaukee, Wis.
● Bonney Forge & Tool Works, Allentown, Pa.
Dresser Mfg. Co., Bradford, Pa.
Snap-On Tools Corp., Kenosha, Wis.
● Williams & Co., J. H., Buffalo, N. Y.

WROUGHT IRON PIPE

See Pipe, Wrought Iron

WROUGHT IRON SHEETS

See Sheets, Wrought Iron

X-RAY MACHINES AND FILM

See Machines and Film, X-Ray

ZINC SHEETS

See Sheets, Zinc

ZONE CONTROLS

See Systems, Heating, Zone Control

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DIRECTORY SECTION

HEATING, PIPING AND AIR CONDITIONING EQUIPMENT FOR INDUSTRY AND LARGE BUILDINGS

PART 2—TRADE NAMES

A-B—Motor controllers. Allen-Bradley Co., Milwaukee, Wis.

ABC—Humidifiers. American Blower Corp., Detroit, Mich.

AGP—Heaters. American Radiator & Standard Sanitary Corp., Pittsburgh, Pa.

A-P—Damper operators, regulators, thermostats, valves. Automatic Products Co., Milwaukee, Wis.

A.P.S.—Metal sheets. Protected Steel Products Co., Washington, Pa.

A.R.A.—Non-metallic sheets and board. Wilson, Inc., Grant, Chicago, Ill.

ARRC — Couplings, fittings, flanges, unions. Union Metal Wks., Chelsea, Mass.

ASBO — Ventilators. American Steel Band Co., Pittsburgh, Pa.

Abrasoweld—Electrodes. Lincoln Electric Co., Cleveland, O.

Absorbex — Insulation. Celotex Corp., The, Chicago, Ill.

Acco-Lastic—Caulking compounds. Accurate Metal Weather Strip Co., Inc., New York, N. Y.

Ace—Damper regulators. Martens & Stormoen, Boston, Mass.

Ace—Pipe, pipe and fittings, tanks, valves, pumps. American Hard Rubber Co., New York, N. Y.

Ace—Steam traps. Connor Engineering Corp., W. B., New York, N. Y.

Ace—Welders. Pier Equipment Mfg. Co., Benton Harbor, Mich.

Acme — Boilers. Titusville Iron Wks. Co., Titusville, Pa.

Acotite—Enamels and lacquers. Acorn Refining Co., Cleveland, O.

Acousteel — Insulation. Celotex Corp., The, Chicago, Ill.

Acousti-Celotex — Insulation. Celotex Corp., The, Chicago, Ill.

Acoustilite — Insulation. Insulite Co., Minneapolis, Minn.

Acoustone — Insulation. United States Gypsum Co., Chicago, Ill.

Acratherm—Thermostats. Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.

Adamant—Fire brick cement. Botfield Refractories Co., Philadelphia, Pa.

Ada-Stic—Insulating cement. Botfield Refractories Co., Philadelphia, Pa.

Adjustiblade — Registers. Tuttle & Bailey, Inc., New Britain, Conn.

Adjusto—Packing. Keasbey & Mattison Co., Ambler, Pa.

Adjust-O-Feeder—Pumps, water treatment. % Proportioneers, Inc. %, Providence, R. I.

Adjustor — Heating systems. Kehm Corp., The, Chicago, Ill.

Adsco — Coils, heaters, joints, meters, pipe, pipe hangers and supports, pipe protectors, separators, strainers, regulators, valves. American District Steam Co., North Tonawanda, N. Y.

Adsco-Bannon—Conduit. American District Steam Co., North Tonawanda, N. Y.

Adsco Rotary—Condensation meters. American District Steam Co., North Tonawanda, N. Y.

Adsco Vertical—Traps. American District Steam Co., North Tonawanda, N. Y.

Aeracool—Blades, fans, louvers and shutters, ventilators. Myers Electric Co., Inc., Pittsburgh, Pa.

Aerate—Ventilators. Aeolus Dickinson, Chicago, Ill.

Aerisweld—Electrodes. Lincoln Electric Co., Cleveland, O.

Aero—Roof ventilators. Jordan & Co., Paul R., Indianapolis, Ind.

Aero-Art—Radiation. National Radiator Co., The, Johnstown, Pa.

Aerocrat—Fans, washers. Ames Co., W. R., San Francisco, Calif.

Aerodyne—Fans. Jeffrey Mfg. Co., Columbus, O.

Aero Flo—Exhausters, fans, louvers, ventilators. Klee Co., Geo. B., Cincinnati, O.

Aerofuse — Air diffusers. Tuttle & Bailey, Inc., New Britain, Conn.

Aeroplane—Roof ventilators. Jordan & Co., Paul R., Indianapolis, Ind.

Aeroplex—Fans. Bayley Blower Co., Milwaukee, Wis.

Aeropull—Roof ventilators. Jordan & Co., Paul R., Indianapolis, Ind.

Aero Seal—Packing. Chicago Belting Co., Chicago, Ill.

Aerospot—Fans. South Bend Air Products Corp., South Bend, Ind.

Aerovalve—Ventilators. Knowles Mushroom Ventilator Co., Montclair, N. J.

Afco—Fans, furnaces, heaters. American Furnace Co., St. Louis, Mo.

Affco — Grilles, hangers, louvers and shutters. American Foundry & Furnace Co., Bloomington, Ill.

Agile—Welding electrodes. American Agile Corp., Cleveland, O.

Agitair—Air diffusers, grilles, heaters, vanes. Air Devices, Inc., New York, N. Y.

Air Control—Fans, heaters, unit air conditioners. Hastings Air Conditioning Co., Hastings, Neb.

Air Lader—Air diffusers, louvers and shutters. Guth Co., Edwin F., St. Louis, Mo.

Air Stone—Conduit. Dockstader, S. E., Washington, D. C.

Air-Van — Ventilators. The Gallaher Co., Owatonna, Minn.

Air Vane — Grilles, registers. Rock Island Register Co., Rock Island, Ill.

Airacoustic — Insulation. Johns-Manville, New York, N. Y.

Air-A-Way — Ventilators. American Metal Products Co., Fort Worth, Tex.

Airco—Welding rod, solder, pipe cutting machines. Air Reduction Sales Co., New York, N. Y.

Air-Con—Registers. Register & Grille Mfg. Co., Inc., Brooklyn, N. Y.

Airefiner — Water treatment. Oakite Products, Inc., New York, N. Y.

Airex — Fans, unit air conditioners. Mountain States Equipment Co., Denver, Colo.

Air-Fan—Window ventilator units. Reliable Sheet Metal Engineering Co., Chicago, Ill.

Air-flo—Louvers and shutters. Belanger Fan & Blower Co., Detroit, Mich.

Air-flo—Dampers, louvers and shutters. Air Conditioning Products Co., Detroit, Mich.

Air-flo—Ventilators. Aeolus Dickinson, Chicago, Ill.

Airfoil—Fans, fan blades. Aerovent Fan Co., Piqua, O.

Airguide—Hygrometers, thermometers. Fee and Stemwedel, Inc., Chicago, Ill.

Airheater — Unit heaters. Airtherm Mfg. Co., St. Louis, Mo.

Airid—Valves. American Radiator & Standard Sanitary Corp., Pittsburgh, Pa.

Airistocrat — Fan blades. Torrington Mfg. Co., Torrington, Conn.

Airline—Grilles, registers. Tuttle & Bailey, Inc., New Britain, Conn.

Airlok — Insulation. Plastegon Wall Board Co., Buffalo, N. Y.

Airmat Arrester — Dust collectors. American Air Filter Co., Inc., Louisville, Ky.

Airmixt — Gas and oil burners. Williams, Inc., F. C., Dearborn, Mich.

Airo-Flex — Registers. Auer Register Co., Cleveland, O.

Air-o-Line — Indicator-controllers, recorder-controllers. Brown Instrument Co., Div. of Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.

Air-O-Matic — Refrigerating machines. Williams Oil-O-Matic Corp., Bloomington, Ill.

Airotherm—Zone control thermostat. Tallmadge & Co., Webster, East Orange, N. J.

Airotor — Blower wheels. Torrington Mfg. Co., Torrington, Conn.

Airplex—Air filters. Davies Air Filter Corp., New York, N. Y.

Airridge—Ventilators. Aeolus Dickinson, Chicago, Ill.

Airstat — Regulators. Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.

Airstream—Air filters. Brauer Supply Co., A. G., St. Louis, Mo.

Airstream—Blower wheels, fans. Morrison Products, Inc., Cleveland, O.

Airswitch—Thermostats. Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.

Air-Vent—Fans. Airtherm Mfg. Co., St. Louis, Mo.

Air-X-Hausters — Roof ventilators. Breidert Co., G. C., Los Angeles, Calif.

Airxpel—Steam traps. Wright-Austin Co., Detroit, Mich.

Ajax—Ducts, fittings, ventilators. Cincinnati Sheet Metal & Roofing Co., Cincinnati, O.

Akon — Water treatment. Allis-Chalmers Mfg. Co., Milwaukee, Wis.

Alcoa — Angles, electrodes, sheets, tanks, tubing. Aluminum Co. of America, Pittsburgh, Pa.

Alkalex — Water treatment. Research Products Corp., Madison, Wis.

All-Vac — Vacuum heating systems. Lonn Mfg. Co., Inc., Chicago, Ill.

Alnor — Thermometers, air velocity meters. Illinois Testing Laboratories, Chicago, Ill.

Alorco—Dehydrators. Aluminum Co. of America, Pittsburgh, Pa.

Aloyco—Stainless steel fittings, nipples, pipe, tubing, unions, valves. Alloy Steel Products Co., Linden, N. J.

Alternarc—Arc welders. Electric Arc, Inc., Newark, N. J.

Aluminweld—Electrodes. Lincoln Electric Co., Cleveland, O.

Always Reliable — Benders, cutters, leak detectors, torches, wrenches. Bernz Co., Inc., Otto, Rochester, N. Y.

Ambler—Cement. Keasbey & Mattison Co., Ambler, Pa.

Amco—Galvanizing powder. American Solder & Flux Co., Philadelphia, Pa.

Amco—Humidifiers, humidistats, hygrometers. American Moistening Co., Providence, R. I.

Amco—Packing. Austin-Mason Co., New York, N. Y.

American—Boilers. Pierce Butler Radiator Corp., Syracuse, N. Y.

American—Couplings. American Flexible Coupling Co., Erie, Pa.

American—Furnaces, heaters. American Foundry & Furnace Co., Bloomington, Ill.

American — Meters. American Meter Co., Inc., New York, N. Y.

American—Speed reducers. American Pulley Co., Philadelphia, Pa.

American — Steel sheets. American Steel & Wire Co., Cleveland, O.

American — Vibration eliminators. American Metal Hose Branch, American Brass Co., Waterbury, Conn.

American — Pumps, water treatment. American Well Works, Aurora, Ill.

American—Pipe benders. American Pipe Bending Machine Co., Inc., Boston, Mass.

American — Water heaters. American Radiator & Standard Sanitary Corp., Pittsburgh, Pa.

Ames — Pumps. Domestic Engine & Pump Co., Shippensburg, Pa.

Aminco—Dehumidifiers, dehydrant, dehydrators, valves. American Injector Co., Detroit, Mich.

Amirglass—Filters. Amirton Co., New York, N. Y.

Ammco—Wrenches. Automotive Maintenance Machinery Co., North Chicago, Ill.

Ammonoduct — Pipe. Bethlehem Steel Co., Bethlehem, Pa.

Ampac — Arc welders. Allis-Chalmers Mfg. Co., Milwaukee, Wis.

Ampco — Dust collectors. American Metal Products Co., Fort Worth, Tex.

Anaconda—Fittings, pipe, welding rod, sheets, solder, tubing, valves. American Brass Co., Waterbury, Conn.

Anemo-light — Air diffusers. Anemostat Corp. of America, New York, N. Y.

Anemo-trol—Air diffusers. Anemostat Corp. of America, New York, N. Y.

Ankorite—Packing. Anchor Packing Co., Philadelphia, Pa.

Anode — Electrodes. Lincoln Electric Co., Cleveland, O.

Anti-Sweat — Insulation. Johns-Manville, New York, N. Y.

A-Pe-Co—Blueprint machines. American Photocopy Equipment Co., Chicago, Ill.

Apex—Pipe cutting and threading machines. Merrell Mfg. Co., Toledo, O.

Apex—Recorders. Uehling Instrument Co., Paterson, N. J.

Apex—Regulators. Ohio Products Co., Cleveland, O.

Apexior — Coatings. Dampney Co. of America, Boston, Mass.

Aqua-Clear — Water treatment. Sudbury Laboratory, South Sudbury, Mass.

Aqualator—Circulators. Triplex Mfg. Co., Peru, Ind.

Aqua-Master—Water heaters. Century Engineering Corp., Cedar Rapids, Ia.

Aquaseal — Cement and compounds. Goetze Gasket & Packing Co., Inc., New Brunswick, N. J.

Aquatrol — Boiler cleaning compounds and water treatment. Aquatic Chemical Laboratories, Inc., New York, N. Y.

Aquiux—Heaters. Johnson Co., S. T. Oakland, Calif.

Arc-Eng—Registers. Register & Grille Mfg. Co., Inc., Brooklyn, N. Y.

Arco — Hangers, plates, radiation, valves. American Radiator & Standard Sanitary Corp., Pittsburgh, Pa.

Arex-Austor—Roof ventilators. Arex Co., Chicago, Ill.

Aridifier—Separators. Logan Engineering Co., Chicago, Ill.

Arin—Louvers and shutters. Arex Co., Chicago, Ill.

Aristocrat—Registers. Auer Register Co., Cleveland, O.

Armco—Pipe, sheets. American Rolling Mill Co., The, Middletown, O.

Armorak — Insulation. Keasbey Co., Robert A., New York, N. Y.

Arrowtrol—Registers. Register & Grille Mfg. Co., Inc., Brooklyn, N. Y.

Artic—Refrigerators. du Pont de Nemours & Co., E. I., Electrochemicals Dept., Wilmington, Del.

Asbestocel — Insulation. Johns-Manville, New York, N. Y.

Asco—Valves, relays, switches. Automatic Switch Co., New York, N. Y.

At-a-Glance—Gages. Krueger Sentry Gauge Co., Green Bay, Wis.

Athol — Pipe fittings, unions. Leavitt Machine Co., Orange, Mass.

Atlas — Unions. Rockwood Sprinkler Co., Worcester, Mass.

Atticvane—Fans. Sturtevant Co., B. F., Hyde Park, Boston, Mass.

Autocoal—Stokers. Crane Co., Chicago, Ill.

Autocrat—Fan blades. Torrington Mfg. Co., Torrington, Conn.

Auto-Klean—Filters, strainers. Cuno Engineering Corp., Meriden, Conn.

Automatic — Tube cleaners. Albright Equipment Co., Johnstown, Pa.

Auto-Tite — Pipe couplings. Superior Railway Products Corp., Pittsburgh, Pa.

Autovent — Eliminators, humidifiers, valves. Maid-O'-Mist, Inc., Chicago, Ill.

Autovent — Fans. Nelson Corp., Herman, Moline, Ill.

Autozone — Zone control unit. Tallmadge & Co., Webster, East Orange, N. J.

Axiflo—Propeller fans. Sturtevant Co., B. F., Boston, Mass.

Axiom—Filters. Blocksom & Co., Michigan City, Ind.

B. B.—Blast gates, valves. Berger Bros. Co., Philadelphia, Pa.

B. B.—Electric motors. Brown-Brockmeyer Co., Dayton, O.

B & B—Heating and air conditioning equipment. Bishop & Babcock Mfg. Co., Cleveland, O.

BCA—Bearings. Bearings Co. of America, Lancaster, Pa.

B & C—Plates. Beaton & Corbin Mfg. Co., Southington, Conn.

B. & G.—Air eliminators, circulators, condensers, coolers, fittings, hangers, heat exchangers, heaters, regulators, tanks, thermostats, valves. Bell & Gossett Co., Morton Grove, Ill.

B & K—Pipe cutting and threading machines. Bignall & Keeler Machine Works, Edwardsville, Ill.

B & W—Boilers, burners, refractories, tubing, stokers, valves. Babcock & Wilcox Co., New York, N. Y.

Badger—Filters. Air Devices, Inc., New York, N. Y.

Badger—Time switches. Reliance Automatic Lighting Co., Racine, Wis.

Balancer—Heating systems. Automatic Temperature Control Co., Inc., Philadelphia, Pa.

Balsam-Wool—Insulation. Wood Conversion Co., St. Paul, Minn.

Bankheat—Oil burners. Johnson Co., S. T., Oakland, Calif.

Bar-Brook—Unit air conditioners, fans. Shreveport Engineering Co., Inc., Shreveport, La.

Barcol — Humidistats, motors, operators, regulators, thermostats, valves. Barber-Colman Co., Rockford, Ill.

Barnes — Cutters. Erie Tool Works, Erie, Pa.

Barry—Bearings, pulleys and sheaves. Dick Co., Inc., R. & J., Passaic, N. J.

Barton-American—Pumps. American-Marsh Pumps, Inc., Battle Creek, Mich.

Battery—Registers. Register & Grille Mfg. Co., Inc., Brooklyn, N. Y.

Beacor—Valves. Beaton & Corbin Mfg. Co., Southington, Conn.

Beauticast—Radiation. Columbia Radiator Co., McKeesport, Pa.

Beaverkill—Leather belting and v-belts. Baldwin Belting, Inc., New York, N. Y.

Bell—Cement. Keasbey & Mattison Co., Ambler, Pa.

Benco — Oil burners. Bennett Co., Omaha, Neb.

Benda Vane — Grilles. Rock Island Register Co., Rock Island, Ill.

Bend-Ezy—Grilles, registers. Standard Stamping & Perforating Co., Chicago, Ill.

Benton—Boilers. Combination Boiler Co., Benton Harbor, Mich.

Bertossa—Furnaces, heaters. Jackson & Church Co., Saginaw, Mich.

Bestfelt—Insulation. Keasbey & Mattison Co., Ambler, Pa.

Beth-Co-Weld—Pipe. Bethlehem Steel Co., Bethlehem, Pa.

Beth-Cu-Loy—Sheets. Bethlehem Steel Co., Bethlehem, Pa.

Bi-Air—Burners. John Zink Co., Tulsa, Okla.

Bifurcator—Fans. DeBothezat Ventilating Equipment Div., American Machine & Metals, Inc., East Moline, Ill.

Big Midget—Soot blowers. Sturtevant Co., B. F., Boston, Mass.

Bildrite — Insulation. Insulite Co., Minneapolis, Minn.

Binoc—Thermometers. Taylor Instrument Companies, Rochester, N. Y.

Birm — Water treatment. Research Products Corp., Madison, Wis.

Bison—Boilers. Farrar & Trefts, Buffalo, N. Y.

Bitumastic—Protective coatings. Wailes Dove - Hermiston Corp., Westfield, N. J.

Bloapco—Dust collectors. Blower Application Co., Milwaukee, Wis.

Blowertrol — Speed changers. White Mfg. Co., St. Paul, Minn.

Blue-Point — Drills, tools, wrenches. Snap-On Tools Corp., Kenosha, Wis.

Blue Ribbon — Hangers or brackets, nipples, plates. Chicago Nipple Mfg. Co., Chicago, Ill.

Branford—Unions. Malleable Iron Fittings Co., Branford, Conn.

Brazarc—Electrodes. Universal Power Corp., Cleveland, O.

Brazo—Solder. Linde Air Products Co., The, Unit of Union Carbide & Carbon Corp., New York, N. Y.

Breeze Spreader—Propeller fans. Victor Electric Products, Inc., Cincinnati, O.

Breezo—Fans. Buffalo Forge Co., Buffalo, N. Y.

Bro-For—Boiler compounds. Brown-Ford Corp., Newton, Mass.

Bronzend — Electrodes. Arcos Corp., Philadelphia, Pa.

Broomell—Eliminators, floats, heating systems, traps, valves. Vapor Specialty Co., New York, N. Y.

BTUnit—Unit heaters. Industrial Mfg. & Engineering Co., Chicago, Ill.

Buf-flow—Propeller fans. Buffalo Forge Co., Buffalo, N. Y.

Bulldog—Shears and snips. Wiss & Sons Co., J., Newark, N. J.

Bull Dog—Stocks and dies. Oster Mfg. Co., Cleveland, O.

Bunker Hill — Fittings, pipe, sheets, solder. Northwest Lead Co., Seattle, Wash.

Burks—Pumps. Decatur Pump Co., Decatur, Ill.

Burnham — Compressors, condensers, pumps. Union Steam Pump Co., Battle Creek, Mich.

Butler—Stokers. Eddy Stoker Corp., Chicago, Ill., and Whiting Stoker Co., Chicago, Ill.

C-E—Boilers. Combustion Engineering Co., New York, N. Y.

C-H—Controllers and starters, heaters, relays, switches, valves. Cutler-Hammer, Inc., Milwaukee, Wis.

CJB—Bearings. Ahlberg Bearing Co., Chicago, Ill.

C & M—Hangers or brackets. Carty & Moore Engineering Co., Detroit, Mich.

CMH — Bellows. Chicago Metal Hose Corp., Maywood, Ill.

C. N. I.—Pipe. Walworth Co., New York, N. Y.

COM—Blowers. Wing Mfg. Co., L. J., New York, N. Y.

CW—Pipe. Spang-Chalfant, Div. of National Supply Co., Pittsburgh, Pa.

Cadillac — Meters. Central Station Steam Co., Detroit, Mich.

Cadman—Valves. Barrett Machine Co., N. S. Pittsburgh, Pa.

Cadwell—Pressure regulators, valves. Beaton & Cadwell Mfg. Co., New Britain, Conn.

Callcel—Insulation. Celotex Corp., The, Chicago, Ill.

Calistone—Insulation. Celotex Corp., The, Chicago, Ill.

Calktite—Cement and compounds. U. S. Stoneware Co., New York, N. Y.

Caloride—Dehumidifiers. Solvay Sales Corp., New York, N. Y.

Calorider—Dehumidifiers. General Air Conditioning Corp., Cincinnati, O.

Calorider — Dehumidifiers, humidifiers, unit air conditioners. Research Corp., New York, N. Y.

Cantilever — Hygrometers. Standard Thermometer, Inc., Boston, Mass.

Capillary—Air washers, dehumidifiers, humidifiers, unit air conditioners. Air & Refrigeration Corp., New York, N. Y.

Capitol—Boilers, hangers or brackets, heaters, radiation. United States Radiator Corp., Detroit, Mich.

Capitol—Insulation. Standard Lime & & Stone Co., Baltimore, Md.

Capitolaire — Unit air conditioners. United States Radiator Corp., Detroit, Mich.

Carbo-Cooler—Cooling surface. Mojonnier Bros. Co., Chicago, Ill.

Careyduct — Ducts and duct fittings Carey Mfg. Co., Philip, Cincinnati, O.

Carstenite—Insulation. Technical Ply-Woods, Chicago, Ill.

Cash-Acme — Heating systems, pipe strainers, regulators, valves, water feeders. Cash Valve Mfg. Co., A. W., Decatur, Ill.

Castirnarc — Electrodes. Universal Power Corp., Cleveland, O.

Castolin — Solder and welding rod. Eutectic Welding Alloys Co., New York, N. Y.

Cataract — Centrifugal pumps. Red Jacket Mfg. Co., Davenport, Ia.

Causul — Valves. Lunkenheimer Co., Cincinnati, O.

Cell-U-Blanket — Insulation. Masonite Corp., Chicago, Ill.

Cellufoam—Insulation. Masonite Corp., Chicago, Ill.

Celoron—Couplings. Continental Diamond Fibre Co., Newark, Del.

Celo-Siding—Insulation. Celotex Corp., The, Chicago, Ill.

Cementseal — Enamels and lacquers. Acorn Refining Co., Cleveland, O.

Cemesto — Insulation. Celotex Corp., The, Chicago, Ill.

Central—Conduit. Spang-Chalfant, Div. of National Supply Co., Pittsburgh, Pa.

Centri-Jet—Centrifugal pumps. Red Jacket Mfg. Co., Davenport, Ia.

Centrimax—Meters. Leeds & Northrup Co., Philadelphia, Pa.

Centripac — Packing, Johns-Manville, New York, N. Y.

Centripeller—Roof ventilators. Jordan & Co., Paul R., Indianapolis, Ind.

Centrispray — Air conditioning units. Bahnson Co., Winston-Salem, N. C.

Certified—Air conditioning units, furnaces, tanks. Stainless & Steel Products Co., St. Paul, Minn.

Chaco—Cement and compounds, boiler and radiator sealing compounds. Desolvo Co., The, Pittsburgh, Pa.

Challenger — Stokers. Link-Belt Co., Chicago, Ill.

Champion — Furnaces, heaters. National Heater Co., Minneapolis, Minn.

Charavay—Propeller fans, unit heaters. Hartzell Propeller Fan Co., New York, N. Y.

Charm—Radiation. Thatcher Furnace Co., Garwood, N. J.

Chevron — Packing. Garlock Packing Co., Palmyra, N. Y.

Chicago—Brakes. Dreis & Krump Mfg. Co., Chicago, Ill.

Chicago-Wrigley—Bolts. Chicago Expansion Bolt Co., Chicago, Ill.

Chico Brikset—Cement. Chicago Fire Brick Co., Chicago, Ill.

Chief — Packing. Keasbey & Mattison Co., Ambler, Pa.

Chieftain — Compressors. Tecumseh. Products Co., Tecumseh, Mich.

Chieftain—Stokers. Conco Corp., Div. of H. D. Conkey & Co., Mendota, Ill.

Chill-Vactor — Steam jet compressors. Croll-Reynolds Engineering Co., Inc., New York, N. Y.

Chinook — Ferrous heating surface. Bayley Blower Co., Milwaukee, Wis.

Chinookfin — Non-ferrous heating surface. Bayley Blower Co., Milwaukee, Wis.

Chip Chaser—Stocks and dies. Oster Mfg. Co., Cleveland, O.

Chromalox—Preheaters, unit heaters. Wiegand Co., Edwin L., Pittsburgh, Pa.

Chromend — Electrodes. Arcos Corp., Philadelphia, Pa.

Chronoflo — Flow meters, recorders. Builders-Providence, Inc., Div. of Builders Iron Foundry, Providence, R. I.

Chronometer—Valves. Defender Automatic Regulator Co., St. Louis, Mo.

Chronotherm—Thermostats. Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.

Circle T—Switches. Trumbull Electric Co., Plainville, Conn.

Circo—Louvers and shutters. Circulators & Devices Mfg. Co., New York, N. Y.

CirCOOLator—Fans, ventilators. Viking Air Conditioning Corp., Cleveland, O.

Clamp-A-Leak — Pipe repair clamps. Chelsea Metal Stamping Co., New York, N. Y.

Clarco—Unit heaters. Clarage Fan Co., Kalamazoo, Mich.

Clark-Sundh — Motor controls. Clark Controller Co., Cleveland, O.

Classic—Registers. Auer Register Co., Cleveland, O.

Cleanair—Aftercoolers. Bell & Gossett Co., Morton Grove, Ill.

Cleanduct—Air filters. Research Products Corp., Madison, Wis.

Cle-Bar—Heaters. Cleghorn Co., Boston, Mass.

Climate Changer—Unit air conditioners, unit air coolers. Trane Co., The, La Crosse, Wis.

Closin — Bolts. Star Expansion Bolt Co., New York, N. Y.

Cocheco—Belting. Williams & Son, I. B., Dover, N. H.

Cochrane-Becker — Pumps. Cochrane Corp., Philadelphia, Pa.

Code-Craft—Headers, heaters, preheaters, tanks. Zallea Brothers & Johnson, Wilmington, Del.

Coey—Cooling towers. Research Corp., New York, N. Y.

Colalloy—Couplings, fittings, flanges, nipples, pipe, sheets, structural shapes, tubing, unions, valves. Colonial Alloys Co., Metals Div., Philadelphia, Pa.

Cold Stream—Unit air conditioners. Baker Ice Machine Co., Inc., Omaha, Nebr.

Colonial — Registers. Auer Register Co., Cleveland, O.

Columbia—Odor adsorbers. Carbide and Carbon Chemicals Corp., New York, N. Y.

Columbia—Ventilators. E. E. Souther Iron Co., St. Louis, Mo.

Combustioneer—Stokers. Steel Products Engineering Co., Springfield, O.

Comet—Fans, unit heaters. New York Blower Co., Chicago, Ill.

Comfort-Air — Humidifiers. Comfort Products Corp., Harvey, Ill.

Comfort Panel—Radiation. Columbus Radiator Co., McKeesport, Pa.

Comfortrol—Effective temperature control. Friez Instrument Div., Bendix Aviation Corp., Towson, Md.

Comfostat—Thermostats. Johnson Service Co., Milwaukee, Wis.

Co-Min-Co—Insulating cement. United States Mineral Wool Co., Chicago, Ill.

Compact—Radiation. Kohler Co., Kohler, Wis.

Compass—Belting. Goodyear Tire & Rubber Co., Akron, O.

Concavex — Bearings. Shafer Bearing Corp., Chicago, Ill.

Conco — Boiler cleaning compounds. water treatment. Continental Products Co., Euclid, O.

Condor—Belting, V belts, pipe. Manhattan Rubber Mfg. Div. of Raybestos Manhattan, Inc., Passaic., N. J.

Condo-Vac — Vacuum pumps. Chicago Pump Co., Chicago, Ill.

Coni-Vane—Ventilators. Allen Corp., Detroit, Mich.

Con-Tac-Tor — Switches. Brown Instrument Co., Div. of Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.

Continental — Stokers. Eddy Stoker Corp., Chicago, Ill., and Whiting Stoker Co., Chicago, Ill.

Control-O-Gas — Valves. Payne Furnace & Supply Co., Inc., Beverly Hills, Calif.

Convector—Humidifiers. Maid-O-Mist, Inc., Chicago, Ill.

Coolair—Fans. American Coolair Corp., Jacksonville, Fla.

Coolite — Windows. Mississippi Glass Co., New York, N. Y.

Coolmaster — Unit coolers. Kramer Trenton Co., Trenton, N. J.

Copaltite — Cement and compounds, gaskets. National Engineering Products, Inc., Washington, D. C.

Copes—Governors, steam desuperheaters, valves. Northern Equipment Co., Erie, Pa.

Cop-R-Loy — Sheets. Wheeling Steel Corp., Wheeling, W. Va.

Coravol—Corrosion treatment. Western Chemical Co., Kansas City, Mo.

Corkoustic — Insulation. Armstrong Cork Co., Lancaster, Pa.

Cornelius—Air compressors and regulators. North Penn Co., New York, N. Y.

Cottrell — Dust collectors. Research Corp., New York, N. Y.

Cottrell — Dust collectors. Western Precipitation Corp., Los Angeles, Calif.

Crescent—Boiler gage cocks. Wright-Austin Co., Detroit, Mich.

Crescent — Burner. Caloroil Burner Corp., Hartford, Conn.

Crescent—Unions. Star Mfg. Co., Inc., Providence, R. I.

Crescent—Valves. Powell Co., Wm., Cincinnati, O.

Cromaloy—Solder. Linde Air Products Co., The, Unit of Union Carbide & Carbon Corp., New York, N. Y.

Crown—Cement and compounds. Colebrook & Sons, Inc., W. H., Syracuse, N. Y.

Crucibleweld — Electrodes. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

Cub 100—Unions. Rhode Island Fittings Co., Hillsgrove, R. I.

Cushiontone — Insulation. Armstrong Cork Co., Lancaster, Pa.

Cut Master — Vertical turret lathes. Bullard Co., The, Bridgeport, Conn.

Cutno—Packing. Greene, Tweed & Co., New York, N. Y.

Cycloidal—Air washers. Blower Application Co., Milwaukee, Wis.

Cyclops—Roller bearings. Roller Bearing Co. of America, Trenton, N. J.

Cyclotherm — Boilers. Ames Iron Works, Div. of Pierce Butler Radiator Corp., Oswego, N. Y.

Cyclotherm — Boilers. General Furnaces Corp., New York, N. Y.

DH—Ball bearings. Dodge Mfg. Corp., Mishawaka, Ind.

D & H—Evaporative condensers, cooling and heating surfaces, unit air conditioners. Drayer & Hanson, Inc., Los Angeles, Calif.

DL—Filters, gages, regulators, relays, switches, thermostats, valves. Detroit Lubricator Co., Detroit, Mich.

DV—Speed changers, v-belt drives. Dodge Mfg. Corp., Mishawaka, Ind.

Damit—Caulking compounds. Quigley Co., Inc., New York, N. Y.

Dart — Unions. Fairbanks Co., New York, N. Y.

Daytex—Cord. Dayton Rubber Mfg. Co., Dayton, O.

Denn—Cleaners. Pierce Co., Wm. B., The, Buffalo, N. Y.

Debecote—Protective coatings. Debevoise Co., The, Brooklyn, N. Y.

Defender — Heaters. Handley Brown Heater Co., Jackson, Mich.

Deflecto—Roof ventilators. Day Co., The, Minneapolis, Minn.

Deflect-O-Grille—Grilles. U. S. Air Conditioning Corp., Minneapolis, Minn.

De Luxe — Strainers. Blackmer Pump Co., Grand Rapids, Mich.

Demandtrol—Valves. Sullivan Valve & Engineering Co., Butte, Mont.

De-Sta-Co.—Fan housings, pipe clamps, valves. Detroit Stamping Co., Detroit, Mich.

Detroit — Traps. Nason Co., Detroit, Mich.

Detroit LoStoker — Stokers. Detroit Stoker Co., Detroit, Mich.

Detroit Unistoker — Stokers. Detroit Stoker Co., Detroit, Mich.

Dew-Aire — Air conditioning units. Standard Computing Scale Co., The, Air Conditioning & Refrigeration Div., Detroit, Mich.

Dexter—Valve reseaters. Leavitt Machine Co., Orange, Mass.

Dexter-Goebel — Systems, regulators. National Brass Co., Grand Rapids, Mich.

Di-Acro — Benders, brakes, shears. O'Neil Irwin Mfg. Co., Minneapolis, Minn.

Dial—Regulators. Martens & Stormoen, Boston, Mass.

Diamond Fibre—Gaskets. Continental Diamond Fibre Co., Newark, Del.

Diamond H — Switches, thermostats. Hart Mfg. Co., Hartford, Conn.

Dickbelt—Belting. Dick Co., Inc., R. & J., Passaic, N. J.

Dickinson Ferrocast — Exhaust heads, ventilators. Aeolus Dickinson, Chicago, Ill.

Dickrope—V belts. Dick Co., Inc., R. & J., Passaic, N. J.

Difr-enshal-Vacm — Heating systems. Dunham Co., C. A., Chicago, Ill.

Dike—Furnace cement. Klee Co., Geo. B., Cincinnati, O.

Dilecto—Plastic pipe. Continental Diamond Fibre Co., Newark, Del.

Direct—Pipe fittings and flanges, separators, strainers. Straight Line Foundry & Machine Corp., Direct Separator Div., The, Syracuse, N. Y.

Directherm—Direct fired heaters. Airtherm Mfg. Co., St. Louis, Mo.

Discfin—Cooling surface. General Refrigeration Div., Yates-American Machine Co., Beloit, Wis.

Disc-Loc—Registers. Knowles Mushroom Ventilator Co., Montclair, N. J.

Distributor—Radiation. Kehm Corp., The, Chicago, Ill.

Divide — Separators. Straight Line Foundry & Machine Corp., Direct Separator Div., The, Syracuse, N. Y.

Dominion—Gaskets, packing. Darcoid Co., Inc., New York, N. Y.

Double Check — Boiler compounds. Hampton-Cross Co., The, Louisville, Ky.

Double Diamond — Hygrometers, recorders, psychrometers. H-B Instrument Co., Philadelphia, Pa.

Double-Seal — Copper tube fittings. Hays Mfg. Co., Erie, Pa.

Dowmetal—Sheets. Dow Chemical Co., Midland, Mich.

Downblast—Unit heaters. Sturtevant Co., B. F., Boston, Mass.

Draftender—Dampers and damper regulators. Penn Electric Switch Co., Goshen, Ind.

Draftite—Cement. Keasbey & Mattison Co., Ambler, Pa.

Draft-O-Stat — Barometric controls. Hotstream Heater Co., Cleveland, O.

Draftrite—Gages. Bacharach Industrial Instrument Co., Pittsburgh, Pa.

Drainator—Traps. Coe Mfg. Co., Painesville, O.

DriAir—Dehumidifiers. Tamms Silica Co., Chicago, Ill.

Dry-Ice—Refrigerants. Pure Carbonic, Inc., New York, N. Y.

Dry-paC — Insulation. Ric-wiL Co., Cleveland, O.

Dualarc—Arc welders. Electric Arc, Inc., Newark, N. J.

Dual-Clone—Dust collectors. Day Co., The, Minneapolis, Minn.

Dualsteel—Unions. Rockwood Sprinkler Co., Worcester, Mass.

Dubbiseal—Insulation. Masonite Corp., Chicago, Ill.

Duco—Enamels and lacquers. du Pont de Nemours & Co. (Inc.), E. I., Fabrics & Finishes Dept., Wilmington, Del.

Ductatherm — Thermostats. Mercoid Corp., The, Chicago, Ill.

Ductype—Fans. South Bend Air Products Corp., South Bend, Ind.

Dulux—Enamels and lacquers. du Pont de Nemours & Co. (Inc.), E. I., Fabrics & Finishes Dept., Wilmington, Del.

Dunco—Relays, switches. Dunn, Inc., Struthers, Philadelphia, Pa.

Duo Blo—Furnaces. American Furnace Co., St. Louis, Mo.

Duoflo—Pipe line strainers. Sheffler-Gross Co., Philadelphia, Pa.

Duo-Stat — Heating systems, thermostats. Johnson Service Co., Milwaukee, Wis.

Duotrol—Regulators. Automatic Control Co., St. Paul, Minn.

Duplex—Insulation. Keasbey & Mattison Co., Ambler, Pa.

Duplex—Pipe cutting machines. Bignall & Keeler Machine Works, Edwardsville, Ill.

Duplex—Pipe line strainers. Maid-O'-Mist, Inc., Chicago, Ill.

Duplex—Tubing. Bridgeport Brass Co., Bridgeport, Conn.

Durabilt—Observation ports. Chicago Fire Brick Co., Chicago, Ill.

DuraBilt — Registers. Auer Register Co., Cleveland, O.

Duradiant — Gas burners. Selas Co., The, Philadelphia, Pa.

Dura-Flex—Registers. Auer Register Co., Cleveland, O.

Dura-Fram—Valves. Detroit Lubricator Co., Detroit, Mich.

Dura-Line—Registers. Auer Register Co., Cleveland, O.

Durant — Pipe. Ehret Magnesia Mfg. Co., Valley Forge, Pa.

DuraSpeed—Sprinkler heads. Grinnell Co., Inc., Providence, R. I.

Durco — Fans, fittings, joints, pipe, pumps, sheets, valves. Duriron Co., Inc., Dayton, O.

Durcopump—Fans, fittings, joints, pipe, pumps, sheets, valves. Duriron Co., Inc., Dayton, O.

Durex — Bearings. General Motors Corp., Moraine Products Div., Dayton, O.

Durichlor—Fans, fittings, joints, pipe, pumps, sheets, valves. Duriron Co., Inc., Dayton, O.

Durimet — Fans, fittings, joints, pipe, pumps, sheets, valves. Duriron Co., Inc., Dayton, O.

Duro Gloss—Steel sheets. Jessop Steel Co., Washington, Pa.

Duroline — Pipe. National Tube Co., United States Steel Corp. Sub., Pittsburgh, Pa.

Duroplastic — Caulking compounds. Acorn Refining Co., Cleveland, O.

Dustkop—Dust collectors. Aget-Detroit Co., Ann Arbor, Mich.

Dust-Stop—Air filters. Owens-Corning Fiberglass Corp., Toledo, O.

Dustube — Dust collectors. American Foundry Equipment Co., Mishawaka, Ind.

Dutch Boy—Solder. National Lead Co., New York, N. Y.

Duxbak—Leather belting and packing. Schieren Co., Chas. A., New York, N. Y.

Dux-Sulation — Insulation. Wilson, Inc., Grant, Chicago, Ill.

Dynaflow — Fans. South Bend Air Products Corp., South Bend, Ind.

Dynetric—Balancing equipment. Gisholt Machine Co., Madison, Wis.

E-C—V belts. Goodyear Tire & Rubber Co., Akron, O.

EC & M—Motor controls. Electric Controller & Mfg. Co., Cleveland, O.

Eafco—Fittings. Eastern Foundry Co., Boyertown, Pa.

Eastern—Tanks. Case & Son Mfg. Co., W. A., Buffalo, N. Y.

Easternoil—Oil burners. Eastern Oil Equipment Co., Portland, Me.

Eastwood—Boilers, radiation. Pierce Butler Radiator Corp., Syracuse, N. Y.

Easyclean—Strainers. Wright-Austin Co., Detroit, Mich.

Easy-Flo—Solder. Handy & Harman, New York, N. Y.

Easyweld—Electrodes. Universal Power Corp., Cleveland, O.

Eclipse — Compressors. Frick Co., Waynesboro, Pa.

Eclipse—Alarms, governors, regulators, traps, valves. Illinois Engineering Co., Chicago, Ill.

Eclipse—Hose. Bendix Aviation Corp., Philadelphia Div., Philadelphia, Pa.

Econolux—Boilers. Johnson Co., S. T., Oakland, Calif.

Econ-o-matic—Bases. American Pulley Co., Philadelphia, Pa.

Economizer — Nozzles. Bahnson Co., Winston-Salem, N. C.

Economy — Boilers, heaters. International Heater Co., Utica, N. Y.

Economy—Heating systems. Maid-O'-Mist, Inc., Chicago, Ill.

Economy—Regulators. Dockson Corp., Detroit, Mich.

Economy—Unit ventilators. Arex Co., Chicago, Ill.

Edgeseal—Air filters. Wilson & Co., Chicago, Ill.

Edwards — Conduit. Munn & Steele, Inc., Newark, N. J.

Efflco—Louvers and shutters. Hirschman Co., W. F., Buffalo, N. Y.

"88" — Pipe covering. Eagle-Picher Lead Co., Cincinnati, O.

88-A—Pipe vise stands. Nye Tool & Machine Co., Chicago, Ill.

Ejectoplaque—Air diffusers. Air & Refrigeration Corp., New York, N. Y.

Electric Filter Watchman—Gages. Herbusch Corp., The, St. Louis, Mo.

Electrifugal—Centrifugal pumps. Allis-Chalmers Mfg. Co., Milwaukee, Wis.

Electro-Matic—Air cleaners. American Air Filter Co., Inc., Louisville, Ky.

Electromode—Electric heaters. Electric Air Heater Co., Div. American Foundry Equipment Co., Mishawaka, Ind.

Electro-Sheet—Sheets. American Brass Co., Waterbury, Conn.

Electro-Wind—Ventilators. Allen Corp., Detroit, Mich.

Electrozone—Ozone apparatus. Automatic Pump & Softener Corp., Rockford, Ill.

Electrunite — Stainless steel tubing. Steel and Tubes, Div. of Republic Steel Corp., Cleveland, O.

Elgin—Arc welders. Borm Mfg. Co., Elgin, Ill.

Elgin — Louvers and shutters. Elgo Shutter & Mfg. Co., Detroit, Mich.

Elite—Registers. Auer Register Co., Cleveland, O.

Elm—Dampers. Elgo Shutter & Mfg. Co., Detroit, Mich.

Eltura—Duct turning vanes. Barber-Colman Co., Rockford, Ill.

Embee—Cement and compounds. Montgomery Bros., San Francisco, Calif.

Emco—Meters, regulators. Pittsburgh Equitable Meter Co., Pittsburgh, Pa.

Emergency—Steam traps. Wright-Austin Co., Detroit, Mich.

Enamel-Kote—Enamels and lacquers. Acme White Lead & Color Works, Detroit, Mich.

Enco—Burners, regulators. Engineer Co., New York, N. Y.

Enduro—Packing. Keasbey & Mattison Co., Ambler, Pa.

Enduro — Pipe, sheets, tubing. Steel and Tubes, Div. of Republic Steel Corp., Cleveland, O.

Enduro—Unions. Jefferson Union Co., Inc., Lockport, N. Y.

Entrained Combustion — Gas burners. Mettler Co., Lee B., Los Angeles, Calif.

Equatherm—Zone control thermostat. Tallmadge & Co., Webster, East Orange, N. J.

Equiflo — Valves. Grinnell Co., Inc., Providence, R. I.

Eroduct—Insulation. Ehret Magnesia Mfg. Co., Valley Forge, Pa.

Erwin—Dampers. Elgo Shutter & Mfg. Co., Detroit, Mich.

Eureka—Valves. Ohio Pattern Wks. & Foundry Co., Eureka Valve Div., Cincinnati, O.

Evactor—Pumps. Croll-Reynolds Engineering Co., Inc., New York, N. Y.

Evapotrol—Valves. Alco Valve Co., St. Louis, Mo.

Evco—Valves. Electric Valve Mfg. Co., Inc., New York, N. Y.

Evenaction — Valves. Taylor Instrument Companies, Rochester, N. Y.

Everlast — Exhaust heads. Straight Line Foundry & Machine Corp., Direct Separator Div., The, Syracuse, N. Y.

Evrtyte—Valves. Strong, Carlisle & Hammond Co., Cleveland, O.

Excel—Unions. Jefferson Union Co., Inc., Lockport, N. Y.

Excelsior—Pumps. Foster Pump Works, Inc., Brooklyn, N. Y.

Excelso — Water heaters. American Radiator & Standard Sanitary Corp., Pittsburgh, Pa.

Exhaustair—Fans. New York Blower Co., Chicago, Ill.

Exidust—Dust collectors. Allen Billmyre Co., Mamaroneck, N. Y.

Extra Dry Esotoo—Liquid sulphur dioxide. Virginia Smelting Co., West Norfolk, Va.

Eye-Hye—Gages. Reliance Gauge Column Co., Cleveland, O.

E-Z-ON — Damper quadrants. Gerett Corp., M. A., Milwaukee, Wis.

Ezy-Kleen—Strainers. Blackmer Pump Co., Grand Rapids, Mich.

F & E—Stokers. Flynn & Emrich Co., Baltimore, Md.

Fabrikated — Grilles, registers. Independent Register Co., Cleveland, O. New York, N. Y.

Faircoseal — Valves. Fairbanks Co., New York, N. Y.

Falcon—Heaters, preheaters. Swoboda, Inc., H. O., New Brighton, Pa.

Fan-Air — Gas burners. Mettler Co., Lee B., Los Angeles, Calif.

Framix—Burners. Coppus Engineering Corp., Worcester, Mass.

Far-Air—Air conditioning units, filters, humidifiers. Farr Co., Los Angeles, Calif.

Farragut—Packing. Darcoid Co., Inc. New York, N. Y.

Fast's—Couplings. Koppers Co., Bartlett Hayward Div., Baltimore, Md.

Favorite — Ratchet wrenches. Greene, Tweed & Co., New York, N. Y.

Featherfin—Heating and cooling surface. Wing Mfg. Co., L. J., New York, N. Y.

Featherweight—Thermostats. Magnet Switch Co., Chicago, Ill.

Featherweight — Unit heaters. Wing Mfg. Co., L. J., New York, N. Y.

Fel-Pro—Gaskets, packing. Felt Products Mfg. Co., Chicago, Ill.

Felt Cote — Metal sheets. American Steel Band Co., Pittsburgh, Pa.

Fenestra — Heat insulating windows. Detroit Steel Products Co., Detroit, Mich.

Fenn's Rotary—Ventilators. Waverly Heating Supply Co., Boston, Mass.

Fenox—Compounds. Halowax Products Div., Union Carbide & Carbon Corp., New York, N. Y.

Fero — Radiation. Burnham Boiler Corp., Irvington, N. J.

Ferrenewo—Valves. Lunkenheimer Co., Cincinnati, O.

Ferroclad — Insulation. Truscon Steel Co., Youngstown, O.

Ferro-Therm — Insulation. American Flange & Mfg. Co., Inc., New York, N. Y.

Ferroweld—Electrodes. Lincoln Electric Co., Cleveland, O.

Fiberglas—Insulation. Owens-Corning Fiberglas Corp., Toledo, O.

Fiberlite — Insulation. Insulite Co., Minneapolis, Minn.

Filmflo — Deaerators. Croll-Reynolds Engineering Co., Inc., New York, N. Y.

Filteraire—Window ventilator and filter units. Davies Air Filter Corp., New York, N. Y.

Fin-Flex — Registers. Auer Register Co., Cleveland, O.

Findlay—Stokers. Bluffton Mfg. Co., The, Findlay, O.

Fin-Line — Registers. Auer Register Co., Cleveland, O.

Firecrete — Refractories. Johns-Manville, New York, N. Y.

Fire-Felt—Insulation. Johns-Manville, New York, N. Y.

Fire-Guard — Stokers. Peerless Mfg. Corp., Louisville, Ky.

Fire Tender—Stokers. Holcomb & Hoke Mfg. Co., Indianapolis, Ind.

Firefoil—Insulating panel. Carey Mfg. Co., Philip, Cincinnati, O.

Fireite—Furnace cement, refractories. Johns-Manville, New York, N. Y.

Fireline—Refractories. Fireline Stove & Furnace Lining Co., Chicago, Ill.

Fireset—Refractories. Walsh Refractories Corp., St. Louis, Mo.

Fireye — Alarms. Combustion Control Corp., Cambridge, Mass.

Flatjet—Spray nozzles. Spraying Systems Co., Chicago, Ill.

Fleetweld—Welding electrodes. Lincoln Electric Co., Cleveland, O.

Fleet-X—Enamels and lacquers. Acme White Lead & Color Works, Detroit, Mich.

Flexarc—Arc welders. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

Flexair — Grilles, registers. Tuttle & Bailey, Inc., New Britain, Conn.

Flexcord—Drives. Gates Rubber Co., Denver, Colo.

Flexeal — Gaskets. Goetze Gasket & Packing Co., Inc., New Brunswick, N. J.

Flexiwound — Gaskets. Azor Corp., Irvington, N. J.

Flexodisc — Expansion joints. Croll-Reynolds Engineering Co., Inc., New York, N. Y.

Floatrol—Switches. Automatic Control Co., St. Paul, Minn.

Flex-Tube—Analyzers, gages, manometers. Dwyer Mfg. Co., F. W., Chicago, Ill.

Flo-Klean — Filters, strainers. Cuno Engineering Corp., Meriden, Conn.

Flo-scope — Meters. Selas Co., The, Philadelphia, Pa.

Flotrol—Valves. Monmouth Products Co., Cleveland, O.

Flotrol-Microfeed—Humidifiers. Monmouth Products Co., Cleveland, O.

Flo-watch — Flow meters. Builders-Providence, Inc., Div. of Builders Iron Foundry, Providence, R. I.

Flualyzer—Analyzers. Engelhard, Inc., Chas., Newark, N. J.

Flush-Kleen — Sewage ejectors and pumps. Chicago Pump Co., Chicago, Ill.

Foamglas — Insulation. Armstrong Cork Co., Lancaster, Pa.

Force-Flo—Circulators, heaters, regulators, systems, tanks. Kehm Corp., The, Chicago, Ill.

Fordair—Compressors. Schramm, Inc., West Chester, Pa.

Forest Fleece—Insulation. Doheny Co., John J., Belmont, Mass.

Fosco—Ventilators. Schoedinger, F. O., Columbus, O.

Francke—Flexible couplings. Waldron Corp., John, New Brunswick, N. J.

Freeman—Stokers. Illinois Iron & Bolt Co., Chicago, Ill.

Fre-Flo — Strainers. Fisher Governor Marshalltown, Ia.

Freon — Refrigerant. Kinetic Chemicals, Inc., Wilmington, Del.

Frevent—Valves. Bridgeport Brass Co., Bridgeport, Conn.

Friction Fighter—Bearings. Link-Belt Co., Indianapolis, Ind.

Frigid—High pressure blowers, propeller fan blades and fans. Circulators & Devices Mfg. Corp., New York, N. Y.

Frigistat — Thermostats. Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.

Frigitower—Cooling towers. Schubert-Christy Corp., Indio, Calif.

Frostaire — Air conditioning units. Palmer Mfg. Corp., Phoenix, Ariz.

Fuel Saver — Boilers. International Boiler Works Co., East Stroudsburg, Pa.

Fulljet—Spray nozzles. Spraying Systems Co., Chicago, Ill.

Fulscope — Recorders, recorder-controllers, regulators. Taylor Instrument Companies, Rochester, N. Y.

Fybr-Tech — Gaskets. Technical Ply-Woods, Chicago, Ill.

Fyr-Feeder — Stokers. American Coal Burner Co., Csicago, Ill.

Fyrite—Analyzers. Bacharach Industrial Instrument Co., Pittsburgh, Pa.

G. B. C.—Fans. General Blower Co., Inc., Philadelphia, Pa.

G-E — Condensers. General Electric Co., Air Conditioning & Commercial Refrigeration Divisions, Bloomfield, N. J.

G-E Glow—Lamps. General Electric Co., Lamp Dept., Nela Park, Cleveland, O.

G-E Mazda—Lamps. General Electric Co., Lamp Dept., Nela Park, Cleveland, O.

G-M — Grilles, louvers and shutters, registers. Gillian Mfg. Co., Detroit, Mich.

G-Fin — Cooling and heating surface. Griscom-Russell Co., The, New York,

G-R—Oil coolers, water chillers. Griscom-Russell Co., The, New York, N. Y.

G-R—Unit coolers and air conditioners. General Refrigeration Div., Yates-American Machine Co., Beloit, Wis.

Gast — Filters, separators. Johnson Corp., Three Rivers, Mich.

Gasweld — Torches, welding rod and apparatus. Liquid Carbonic Corp., The, Chicago, Ill.

Geddes—Radiation. Fowler & Wolfe Radiator Co., Norristown, Pa.

Gemaco — Compressors. General Machinery Co., Spokane, Wash.

Gemware — Hygrometers, psychrometers, thermometers. G. M. Mfg. Co., New York, N. Y.

Genasco—Insulation, pipe joint cement and compounds. Barber Asphalt Corp., Barber, N. J.

Genuine Stillson—Wrenches. Walworth Co., New York, N. Y.

Germicidal — Lamps. General Electric Co., Lamp Dept., Cleveland, O.

Gerotor—Rotary pumps. May Oil Burner Corp., Baltimore, Md.

Geyser—Water heaters. Thatcher Furnace Co., Garwood, N. J.

Giant — Radiator hangers. Western Hanger Co., San Francisco, Calif.

Gilbarco—Compressors, regulators. Gilbert & Barker Mfg. Co., West Springfield, Mass.

Gilcoal—Stokers. Catskill Metal Works, Inc., Catskill, N. Y.

Gilsonite—Protective coatings. Ohmlac Paint & Refining Co., Chicago, Ill.

Gilt Edge—Belting. Rhoads & Sons, J. E., Philadelphia, Pa.

Gimco — Insulation. National Gypsum Co., Buffalo, N. Y.

Gland-Pakt—Expansion joints. Yarnall-Waring Co., Philadelphia, Pa.

Glazola — Caulking compounds. Nebel Mfg. Co., Cleveland, O.

Globack—Pipe flanges. Midwest Piping & Supply Co., Inc., St. Louis, Mo.

Globe—Ventilators. Osborn Co., The J. M. & L. A., Cleveland, O.

Gloco Red Band—Water heaters. Glore Sales Corp., Evins F., New York, N. Y.

Glowan—Gas burners. Martin, J. O. & C. U., San Francisco, Calif.

Goetzerit—Packing. Goetze Gasket & Packing Co., Inc., New Brunswick, N. J.

Gohi — Sheets. Newport Rolling Mill Co., Newport, Ky.

Gold Bond—Insulation. National Gypsum Co., Buffalo, N. Y.

Gold-Seal—Boilers. Pierce Butler Radiator Corp., Syracuse, N. Y.

Golden Rod — Blower wheels, fans, heaters, unit air conditioners. Jaden Mfg. Co., Inc., F., Hastings, Neb.

Goodyearite—Packing. Goodyear Tire & Rubber Co., Akron, O.

Grad-U-Motor — Damper operators. Minneapolis - Honeywell Regulator Co., Minneapolis, Minn.

Gradustat — Regulators, thermostats. Minneapolis - Honeywell Regulator Co., Minneapolis, Minn.

Gradutrol—Diaphragm valves. Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.

Graylite—Insulation. Insulite Co., Minneapolis, Minn.

Greastop—Air filters. Air-Maze Corp., Cleveland, O.

Grid — Cooling and heating surface, unit heaters. Murray Mfg. Co., D. J., Wausau, Wis.

Grillometer—Direct reading air velocity meters. Detroit Air Meter Co., Detroit, Mich.

Gruvagrip — Couplings. Gustin Bacon Mfg. Co., Kansas City, Mo.

Guardian—Gaskets. Garlock Packing Co., Palmyra, N. Y.

Gun-Pakt—Expansion joints. Yarnall-Waring Co., Philadelphia, Pa.

Guthfan—Fans. Guth Co., Edwin F., St. Louis, Mo.

H & C — Grilles, registers. Hart & Cooley Mfg. Co., Holland, Mich.

H.C.—Stokers. Whiting Stoker Co., Chicago, Ill.

H-O-H — Compounds, feeders, steam system and water treatment. Haering & Co., Inc., D. W., Chicago, Ill.

H-T — Smoke alarms. Au-Temp-Co Corp., New York, N. Y.

Hairbestos—Insulation. Wilson & Co., Chicago, Ill.

Haircraft—Insulation. Wilson & Co., Chicago, Ill.

Hammerkraft — Enamels and lacquers. Hilo Varnish Corp., Brooklyn, N. Y.

Hammermill—Belting. Goodyear Tire & Rubber Co., Akron, O.

Hammer-On—Damper quadrants. Air Control Products, Inc., Coopersville, Mich.

Hammer-Set — Bolts. Rawlplug Co., Inc., The, New York, N. Y.

Handy—Benders. Holsclaw Bros., Inc., Evansville, Ind.

Handy—Ducts and duct fittings. Meyer & Bro. Co., F., Peoria, Ill.

Handy Andy — Vise stands. Western Wire Products Co., St. Louis, Mo.

Hardweld — Electrodes. Lincoln Electric Co., Cleveland, O.

Hartman — Air conditioning units. Norwood Filtration Co., The, Florence, Mass.

Hartmann — Heaters. Montgomery Bros., San Francisco, Calif.

Haveg—Tanks. Continental Diamond Fibre Co., Newark, Del.

Hazleton — Pumps, strainers, valves. Barrett, Haentjens & Co., Hazleton, Pa.

Health-Air—Ventilator and filter units. Reliable Sheet Metal Engineering Co., Chicago, Ill.

Health-Aire—Fans, heaters, unit coolers, ventilators. Johnson Fan & Blower Co., Chicago, Ill.

Heart-Oak—Belting. Graton & Knight Co., Worcester, Mass.

Heat-aid—Refractories. Pyrolite Products Co., Cleveland, O.

Heath—Manometers. Detroit Air Meter Co., Detroit, Mich.

Heatomat—Heaters. Richmond Radiator Co., Gas Products Div., Uniontown, Pa.

Heat-Rite—Registers. Auer Register Co., Cleveland, O.

Heggie-Simplex—Boilers. Lookout Boiler & Mfg. Co., Chattanooga, Tenn.

Helical—Tubing. Rome-Turney Radiator Co., Rome, N. Y.

Hellite—Refractories. Johns - Manville, New York, N. Y.

Hensel—Welders. Maple Valley Mfg. Co., Mapleton, Ia.

Herco—Arc welders. Hercules Electric & Mfg. Co., Inc., Brooklyn, N. Y.

Herculoy—Welding rod, tubing. Revere Copper and Brass, Incorporated, New York, N. Y.

Hevikoat—Electrodes. Universal Power Corp., Cleveland, O.

Highflex—Belting. Goodrich Co., B. F., Akron, O.

High-Ten-500—Solder. Industrial Service Laboratories, Milwaukee, Wis.

Hi-Gloss—Steel sheets. Jessop Steel Co., Washington, Pa.

Hijet—Unit heaters. Nelson Corp., Herman, Moline, Ill.

Hilger—Chillers, refrigerating compressors, unit coolers, unit air conditioners, valves. XL Refrigerating Co., Inc., Chicago, Ill.

Hi-Lift—Pumps. Peerless Pump Div., Food Machinery Corp., Canton, O.

Hi-Lo—Alarms. Yarnall-Waring Co., Philadelphia, Pa.

Hi-Lo—Pumps. Yeomans Bros. Co., Chicago, Ill.

Hi-Seal—Cement and compounds. Greene, Tweed & Co., New York, N. Y.

Hi-Spra — Spray nozzles. Schubert-Christy Corp., Indio, Calif.

Hitchings—Boilers. Burnham Boiler Corp., Irvington, N. Y.

Hi-Temp—Insulation. Carey Mfg. Co., Philip, Lockland, Cincinnati, O.

Hi-Test—Pipe. Walworth Co., New York, N. Y.

Holby—Valves. Boiler Room Equipment, Inc., New York, N. Y.

Holdfast—Solder. American Brass Co., Waterbury, Conn.

Hollo-Tech—Doors and panels. Technical Ply-Woods, Chicago, Ill.

Holt—Strainers, tube cleaners. Rosedale Foundry & Machine Co., Pittsburgh, Pa.

Holtite—Clamps. Yarnall-Waring Co., Philadelphia, Pa.

Horneblende — Caulking compounds. North American Fibre Products Co., The, Cleveland, O.

Horton—Tanks. Chicago Bridge & Iron Co., Chicago, Ill.

Hot Shot—Pumps. Yeomans Bros. Co., Chicago, Ill.

Hot Spot—Spot welders. Acme Electric Welder Co., Los Angeles, Calif.

Hotpoint—Water heaters. Edison General Electric Appliance Co., Inc., Chicago, Ill.

Hovalco—Valves. Homestead Valve Mfg. Co., Coraopolis, Pa.

Huber—Stokers. Flynn & Emrich Co., Baltimore, Md.

Humidair—Humidifiers. Skilbeck Mfg. Co., Kenosha, Wis.

Humid-Heet—Radiators. Utica Radiator Corp., Utica, N. Y.

Humidigrad — Humidifiers. Monmouth Products Co., Cleveland, O.

Humidigraph — Humidity recorders. Bristol Co., Waterbury, Conn.

Humidiguide—Hygrometers. Taylor Instrument Companies, Rochester, N. Y.

Humidostat—Humidistats. Johnson Service Co., Milwaukee, Wis.

Humiduct—Humidifiers. Bahnson Co., Winston-Salem, N. C.

Humi-Temps—Unit air coolers. Larkin Coils, Inc., Atlanta, Ga.

Humphrey—Unit heaters. General Gas Light Co., Kalamazoo, Mich.

Hurivent—Valves. American Radiator & Standard Sanitary Corp., Pittsburgh, Pa.

Hycarb—Electrodes. Universal Power Corp., Cleveland, O.

Hydra — Valves. Albright Equipment Co., Johnstown, Pa.

Hydramotor—Valves. General Controls Co., Glendale, Calif.

Hydro—Recorders. Bacharach Industrial Instrument Co., Pittsburgh, Pa.

Hydro—Packing. Keasbey & Mattison Co., Ambler, Pa.

Hydro-Clone — Condensers, dust collectors, welding fume exhausters. Whiting Corp., Harvey, Ill.

Hydro-Foil — Pumps. Peerless Pump Div., Food Machinery Corp., Canton, Ohio.

Hydron—Bellows, traps. Clifford Mfg. Co., Boston, Mass.

Hydrovac—Pumps. Ames Hydrovac Corp., Brooklyn, N. Y.

Hydro-Whirl—Dust collectors. Peters-Dalton, Inc., Detroit, Mich.

Hy-Duty—Blower wheels, fans. Schwitzer-Cummins Co., Indianapolis, Ind.

Hylo—Heating systems. Webster & Co., Warren, Camden, N. J.

Hy-Power—Shears and snips. Wiss & Sons Co., J., Newark, N. J.

Hy-Temp—Cement, insulation. Keasbey & Mattison Co., Ambler, Pa.

Hytempite—Cement, refractories. Quigley Co., Inc., New York, N. Y.

Hy-Test—Water heaters. Smith Co., Inc., H. B., The, Westfield, Mass.

Hytherstat—Combination humidity and temperature control. Friez Instrument Div., Bendix Aviation Corp., Towson, Md.

Hytor—Pumps. Nash Engineering Co., South Norwalk, Conn.

I-R—Ingersoll-Rand, New York, N. Y.

Ice Engine—Gas and diesel engines. Waukesha Motor Co., Waukesha, Wis.

Ice-O-Matic — Refrigerating compressors. Williams Oil-O-Matic Heating Corp., Bloomington, Ill.

Icy-Flo—Accumulators. McQuay, Inc., Minneapolis, Minn.

Ideal—Blowers. Perfection Grate & Stoker Co., Springfield, Mass.

Ideal—Boilers, water heaters, valves. American Radiator & Standard Sanitary Corp., Pittsburgh, Pa.

Ideal—Ventilators. Tuttle & Bailey, Inc., New Britain, Conn.

Ideal—Traps. Nason Co., Detroit, Mich.

Immersatherm — Thermostats. Mercoid Corp., The, Chicago, Ill.

Immersion-o-matic — Water heaters. Sellers Engineering Co., Chicago, Ill.

Impact—Spray nozzles. Cooling Tower Co., Inc., The, Div. of the Fluor Corp., Ltd., New York, N. Y.

Imperial—Boilers. National Radiator Co., The, Johnstown, Pa.

Inco—Pipe fittings, pipe, rod, sheets, tubing. International Nickel Co., Inc., The, New York, N. Y.

Inconel—Pipe fittings, pipe, sheets, tubing. International Nickel Co., Inc., The, New York, N. Y.

IngAclad—Stainless clad sheets. Ingersoll Steel & Disc Div., Borg-Warner Corp., Chicago, Ill.

In-Hib-Co—Protective coatings. Haering Co., Inc., D. W., Chicago, Ill.

Inkstop — Air filters. Air-Maze Corp., Cleveland, O.

Ins-lite—Insulation. Insulite Co., Minneapolis, Minn.

Instant—Heaters, preheaters. Johnson Corp., Three Rivers, Mich.

Insulag—Insulation. Quigley Co., Inc., New York, N. Y.

Insulblox — Insulation. Quigley Co., Inc., New York, N. Y.

Insulcrete—Insulating cement. Quigley Co., Inc., New York, N. Y.

Insulduct — Ducts and duct fittings. Smith-Raymond Co., Columbus, Ga.

Insulfil —Insulation. Refractory & Insulation Corp., New York, N. Y.

Insulwool—Insulation. General Insulating Products Co., Brooklyn, N. Y.

Insutube—Insulation. Union Asbestos & Rubber Co., Cicero, Ill.

Intensarc—Electrodes. National Carbon Co., Carbon Products Div., Cleveland, O.

Involute—Spray nozzles. Yarnall-Waring Co., Philadelphia, Pa.

Ionaire—Ionization apparatus. Electroaire Corp., Chicago, Ill.

Irenew—Powell Co., Wm., Cincinnati, Ohio.

Ironset — Furnace cement. Fireline Stove & Furnace Lining Co., Chicago, Ill.

Ironton—Burners. Continental Stove Corp., Ironton, O.

J F S—Speed changers and reducers. Stephens-Adamson Mfg. Co., Aurora, Ill.

J-M Ball—Floats, traps. Cryer Trap & Valve Co., Inc., New York, N. Y.

J. M. C.—Burners. Johnson Mfg. Co., Waterloo, Ia.

Janitrol — Burners, heaters, unit air conditioners. Surface Combustion, Toledo, O.

Jarco—Unions. Jarecki Mfg. Co., Erie, Pa.

Jennings—Pumps, ejectors. Nash Engineering Co., South Norwalk, Conn.

Jetal—Protective coatings. Alrose Chemical Co., Providence, R. I.

Jewel—Packing. Keasbey & Mattison Co., Ambler, Pa.

John Crane—Cement and compounds. Crane Packing Co., Chicago, Ill.

Jones — Stokers. Riley Stoker Corp., Worcester, Mass.

Julian d'Este—Controls, floats, governors, regulators, strainers, thermostats, traps, valves. Reading-Pratt & Cady Div., American Chain & Cable Co., Inc., Reading, Pa.

Junior—Radiation. Weil-McLain Co., Chicago, Ill.

Jusrite—Ducts and duct fittings. Corbman Bros., Inc., Philadelphia, Pa.

K—Fittings. Kuhns Brothers Co., Dayton, O.

K. A. T.—Compounds and water treatment. American K.A.T. Corp., New York, N. Y.

K-B—Dampers, regulators. Kerentoff, G. L., Cincinnati, O.

K-Fin—Cooling and heating surface. Griscom-Russell Co., The, New York, N. Y.

K and M—Alarms, controls, strainers, traps, valves. Kieley & Mueller, Inc., North Bergen, N. J.

K-S-V—Ventilators. Kernchen Co., Chicago, Ill.

Kable Kord—Belting. Gilmer Co., L. H., Philadelphia, Pa.

Kane—Boilers, gas burners. Mears-Kane-Ofeldt, Inc., Philadelphia, Pa.

Karbate—Carbon pipe, heat exchangers, pumps. National Carbon Co., Carbon Products Div., Cleveland, O.

Kathabar — Dehumidifiers, humidifiers, unit air conditioners. Surface Combustion, Toledo, O.

Kaukit—Caulking compounds. Sonneborn Sons, Inc., L., New York, N. Y.

Kearsarge—Gaskets, packing. Johns-Manville, New York, N. Y.

Kelly—Valves. National Metal Products Corp., Chicago, Ill.

Kentucky—Sheets. Newport Rolling Mill Co., Newport, Ky.

Key-Tite—Cement and compounds. Key Co., East St. Louis, Ill.

Kidskin—Packing. Darcoid Co., Inc., New York, N. Y.

Kimsul — Insulation. Kimberly-Clark Corp., Neenah, Wis.

King-clip—Valves. Lunkenheimer Co., Cincinnati, O.

King Coal—Stokers. Eddy Stoker Corp., Chicago, Ill.

King-Gage—Gages. King Engineering Corp., Ann Arbor, Mich.

Kleen Air—Air filters. Kaye & MacDonald, Inc., West Orange, N. J.

Kleen Tube—Heaters. Vapor Car Heating Co., Inc., Chicago, Ill.

Kleenflo — Unit air filters. Air-Maze Corp., Cleveland, O.

Klingtite—Belting. Goodyear Tire & Rubber Co., Akron, O.

Klixon—Temperature controls. Spencer Thermostat Co., Attleboro, Mass.

Klondike—Arc welders. Fern, Ralph. Scranton, Pa.

K-Master—Strainers, traps. Kaye & MacDonald, Inc., West Orange, N. J.

Knight-Ware — Pipe, prefabricated ducts, valves. Knight, Maurice A., Akron, O.

Knock-Out — Arc welders. Lee Co., K. O., Aberdeen, S. D.

Kno-Draft—Air diffusers. Connor Engineering Corp., W. B., New York, N. Y.

Koldboard — Insulation. Baldwin-Hill Co., Trenton, N. J.

Kon-Nec-Tor—Mercury switches. General Electric Co., Lamp Dept., Cleveland, O.

Kool-Shade — Solar heat resisting screens. Ingersoll Steel & Disc Div., Borg-Warner Corp., Chicago, Ill.

Kooler-Aire — Commercial air conditioners. United States Air Conditioning Corp., Minneapolis, Minn.

Koven—Boilers. Waterfilm Boilers, Inc., Jersey City, N. J.

Kristokrak — Enamels and lacquers. Zapon Div., Atlas Powder Co., North Chicago, Ill.

Krupp—Valves. Shank Co., Cyrus, Chicago, Ill.

L. A.—Motors. Louis Allis Co., Milwaukee, Wis.

L-M—Tubing. Lewin-Mathes Co., Lewin Metals Div., St. Louis, Mo.

L&N—Regulators. Leeds & Northrup Co., Philadelphia, Pa.

L-R—Couplings. Lovejoy Flexible Couplings Co., Chicago, Ill.

L. R. D. — Valves. Grinnell Co., Inc., Providence, R. I.

Laddi—Heaters. Johnson Co., S. T., Oakland, Calif.

Lawson—Wrenches. USHCO Mfg. Co., Inc., Buffalo, N. Y.

Lead-Sealed—Lead sheets. Continental Steel Corp., Kokomo, Ind.

Lectrodryer—Dehumidifiers. Pittsburgh Lectrodryer Corp., Pittsburgh, Pa.

Lectro Shear—Shears. Black & Decker Mfg. Co., Towson, Md.

Ledaloyl — Sleeve bearings. Johnson Bronze Co., New Castle, Pa.

Levelometer—Gages, recorders. Liquidometer Corp., Long Island City, N. Y.

Liberty—Packing. Johns-Manville, New York, N. Y.

Light Duty — Pulleys. Gates Rubber Co., The, Denver, Colo.

Lightning—Cleaning compounds. Western Chemical Co., Kansas City, Mo.

Lightweight Champion — Pipe cutting machines. Nye Tool & Machine Co., Chicago, Ill.

Lima—Stokers. Carnes, Inc., John R., Lima, O.

Limit-Load—Centrifugal fans. Buffalo Forge Co., Buffalo, N. Y.

Limitorque—Valves. Philadelphia Gear Works, Inc., Philadelphia, Pa.

Limpet—Insulation. Keasbey & Mattison Co., Ambler, Pa.

Linabestos—Insulation. Celotex Corp., The, Chicago, Ill.

Lin-X—Enamels and lacquers. Acme White Lead & Color Works, Detroit, Mich.

Lipco—Cement lined fittings and pipe. Cement Lined Pipe Co., Lynn, Mass.

Lipman—Compressors, cooling surface, water chillers. General Refrigeration Div., Yates-American Machine Co., Beloit, Wis.

Liquivator—Pumps. Morehead Mfg. Co., Detroit, Mich.

Little Blacksmith — Punches, shears. Kidder Mfg. Co., Inc., J. F., Burlington, Vt.

Little Giant—Stocks and dies. Greenfield Tap & Die Corp., Greenfield, Mass.

Little Giant—Radiation. Pierce Butler Radiator Corp., Syracuse, N. Y.

Little Giant—Switches. Tork Clock Co., Inc., Mt. Vernon, N. Y.

Lo-Blast—Burners. National Machine Wks., Chicago, Ill.

Locarb—Electrodes. Universal Power Corp., Cleveland, O.

Lockaire—Insulation. Plastergon Wall Board Co., Buffalo, N. Y.

Locktite—Regulators. Ohio Products Co., Cleveland, O.

Lodi—Boilers. Super Mold Corp., Lodi, Calif.

Lok-Joint — Insulation. Insulite Co., Minneapolis, Minn.

Lolag—Heaters. American Instrument Co., Silver Spring, Md.

Lo-Maintenance—Motors and starters. Allis-Chalmers Mfg. Co., Milwaukee, Wis.

Longrip—Pipe extractors. Ridge Tool Co., Elyria, O.

Lord Burnham — Boilers. Burnham Boiler Corp., Irvington, N. Y.

Lowcost—Boilers. Murray Iron Wks. Co., Burlington, Ia.

Loxin—Bolts. Star Expansion Bolt Co., New York, N. Y.

Lubricore—Packing. Goetze Gasket & Packing Co., Inc., New Brunswick, N. J.

Lul—Unit coolers. Merchant & Evans Co., Philadelphia, Pa.

Luminare—Electrodes. Universal Power Corp., Cleveland, O.

Lyonore—Sheets. Lyon, Conklin & Co., Inc., Baltimore, Md.

M. E.—Motors. Marathon Electric Mfg. Corp., Wausau, Wis.

M. & E.—Refrigerating compressors. Merchant & Evans Co., Philadelphia, Pa.

MGC—Compressors. Hobart Bros. Co., Troy, O.

M & M — Alarms, cut-offs, feeders, humidifiers, operators, switches, valves. McDonnell & Miller, Chicago, Ill.

M & S—Gaskets, insulation. Mitchell & Smith, Inc., Detroit, Mich.

MIF — Couplings, fittings. Malleable Iron Fittings Co., Branford, Conn.

MJL — Gages, manometers, meters, recorders. Morey & Jones, Ltd., Los Angeles, Calif.

MKO—Boiler feeders, pumps. Mears-Kane-Ofeldt, Inc., Philadelphia, Pa.

M-R-C—Ball bearings. Marlin-Rockwell Corp., Jamestown, N. Y.

M/W and A/C Airmat — Air filters. American Air Filter Co., Inc., Louisville, Ky.

Macheta—Fans, fan blades. Aerovent Fan Co., Piqua, O.

Magic Grip — Sheaves. Allis-Chalmers Mfg. Co., Milwaukee, Wis.

Magic-Weather — Air washers, fans. Ballantyne Co., Omaha, Nebr.

Majestic — Boilers. Ames Iron Wks., Div. of Pierce Butler Radiator Corp., Oswego, N. Y.

Manganend — Electrodes. Arcos Corp., Philadelphia, Pa.

Manganweld—Electrodes. Lincoln Electric Co., Cleveland, O.

Mani-Ply—Insulation. Keasbey & Mattison Co., Ambler, Pa.

Mark Time — Time switches. Rhodes, Inc., M. H., Hartford, Conn.

Martell—Packing. France Packing Co., Tacony, Philadelphia, Pa.

Marval—Valves. Marsh Corp., Jas. P., Chicago, Ill.

Mascobond—Furnace cement. Munn & Steele, Inc., Newark, N. J.

Mascocement—Refractories. Munn and Steele, Inc., Newark, N. J.

Mascolite—Pipe insulation. Munn and Steele, Inc., Newark, N. J.

Mascote—Insulation. Munn and Steele, Inc., Newark, N. J.

Massachusetts — Fans, unit heaters, blower wheels, air washers. Bishop & Babcock Mfg. Co., Cleveland, O.

Master — Stokers. Muncie Gear Wks., Inc., Muncie, Ind.

Master — Thermostats, regulators, switches. White Mfg. Co., St. Paul, Minn.

Master—Unions. Jefferson Union Co., Inc., Lockport, N. Y.

Master Kraft—Oil burners, unit heaters and air conditioners. Harvey-Whipple, Inc., Springfield, Mass.

Master Pilot—Valves. Powell Co., Wm., Cincinnati, O.

McDaniel — Floats, traps. Watson & McDaniel Co., Philadelphia, Pa.

McKee — Blowers, boilers, burners, feeders, pumps, regulators, tanks, torches, valves. Eclipse Fuel Engineering Co., Rockford, Ill.

McKeesport — Radiation. Columbia Radiator Co., McKeesport, Pa.

McKnight—Registers. Tuttle & Bailey, Inc., New Britain, Conn.

Measurrench — Wrenches. Williams & Co., J. H., Buffalo, N. Y.

Mechanovent—Ventilators. New York Blower Co., Chicago, Ill.

Meco — Torches, valves, welding rod. Modern Engineering Co., St. Louis, Mo.

Melloblu—Gas burners. Beck Engineering Combustion Kompany, St. Louis, Mo.

Mel-Rock—Humidifiers, units, ventilators, washers. Mellish & Murray Co., Chicago, Ill.

Merkustat — Regulators, switches. Marsh Corp., Jas. P., Chicago. Ill.

Merrill Process — Heating systems. Parks-Cramer Co., Fitchburg, Mass.

Metal-Master — Shears. Wiss & Sons Co., J., Newark, N. J.

Metermax — Combustion control systems. Leeds & Northrup Co., Philadelphia, Pa.

Metl-Tech — Metal sheets. Technical Ply-Woods, Chicago, Ill.

Metric—Meters. American Meter Co., Inc., New York, N. Y.

Metrotherm — Thermostats. General Controls Co., Glendale, Calif.

Micro—Low water cut-offs. Maid-O-Mist, Inc., Chicago, Ill.

Micromax — Hygrometers, recorders, recorder-controllers, thermometers. Leeds & Northrup Co., Philadelphia, Pa.

Micromet—Water treatment. Calgon, Inc., Pittsburgh, Pa.

Microstat—Thermostats. Friez Instrument Div., Bendix Aviation Corp., Towson, Md.

Microtherm—Thermostats. Barber-Colman Co., Rockford, Ill.

Micro-Weld—Spot welders. Micro Products Co., Chicago, Ill.

Midget — Radiation. Utica Radiator Corp., Utica, N. Y.

Midget — Regulators. Ohio Products Co., Cleveland, O.

Mills—Boilers. Smith Co., Inc., H. B. The, Westfield, Mass.

Milvaco—Air eliminators, floats, strainers, traps, valves. Milwaukee Valve Co., Milwaukee, Wis.

Milwaukee—Heaters. Blower Application Co., Milwaukee, Wis.

Minfelt—Insulation. Mitchell & Smith, Inc., Detroit, Mich.

Minit Stoker—Water heaters. Catskill Metal Works, Inc., Catskill, N. Y.

Miracle Air—Window ventilator units. Reliable Sheet Metal Engineering Co., Chicago, Ill.

Mir-O-Meter—Combustion control systems. Bowser, Inc., Fort Wayne, Ind.

Mirro-Matic—Heaters. Handley Brown Heater Co., Jackson, Mich.

Mirro-Shell—Heaters. Handley Brown Heater Co., Jackson, Mich.

Mixend — Electrodes. Arcos Corp., Philadelphia, Pa.

MKayO — Boilers. Mears-Kane-Ofeldt, Inc., Philadelphia, Pa.

Mobilene — Gaskets. Johns-Manville, New York, N. Y.

Model Star—Valves. Powell Co., Wm., Cincinnati, O.

Moderator — Heating system. Warren Webster Co., Camden, N. J.

ModernAire—Fans, unit air conditioners. Dallas Engineering Co., Inc., Dallas, Tex.

Moduflow — Control systems. Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.

Modustat — Valves. Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.

Modutrol — Heating systems. Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.

Modutron — Regulators. Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.

Mogul—Packing. Johns-Manville, New York, N. Y.

Mogul—Boiler cleaning compounds and water treatment. North American Fibre Products Co., The, Cleveland, O.

Mohawk—Pipe. Cohoes Rolling Mill Co., Cohoes, N. Y.

Moisturator—Humidifiers. Bridgeport Brass Co., Bridgeport, Conn.

Moncrief — Sheet metal pipe and fittings. Henry Furnace Co., The, Medina, O.

Moncrief Hi - Capacity — Furnaces. Henry Furnace Co., The, Medina, O.

Monel—Pipe fittings, pipe, sheets, tubing. International Nickel Co., Inc., The, New York, N. Y.

Mongol — Pipe joint cement and compounds. Baer Bros., New York, N. Y.

Monobloc—Centrifugal pumps. Worthington Pump & Machinery Corp., Harrison, N. J.

Mono-Block—Insulation. Baldwin-Hill Co., Trenton, N. J.

Mono-Cast—Pipe. American Cast Iron Pipe Co., Birmingham, Ala.

Monoflo — Hot water heating systems and fittings. Bell & Gossett Co., Morton Grove, Ill.

Monsoon—Fans, grilles, louvers. Jamieson Mfg. Co., Dallas, Texas.

Morflex — Flexible couplings. Morse Chain Co., Ithaca, N. Y.

Mortairset—Refractories. Walsh Refractories Corp., St. Louis, Mo.

Mortex—Insulation. Mortell Co., J. W., Kankakee, Ill.

Mortite—Caulking compounds, gaskets. Mortell Co., J. W., Kankakee, Ill.

Motoco—Gages, gage glasses, recorders, thermometers. Electric Auto-Lite Co., Motor Meter Gauge & Equipment Div., La Crosse, Wis.

Moto-Merco—Relays. Automatic Temperature Control Co., Inc., Philadelphia, Pa.

Motopump—Pumps. Yeomans Bros. Co., Chicago, Ill.

MotoReducer — Speed reducers. Philadelphia Gear Works, Inc., Philadelphia, Pa.

Motorstoker — Stokers. Hershey Machine & Foundry Co., Motorstoker Div., Manheim, Pa.

Motosteel—Valves. Taylor Instrument Companies, Rochester, N. Y.

Ototurb—Ventilators. Uno Ventilator Co., Cliftondale, Mass.

Muffletone—Insulation. Celotex Corp., The, Chicago, Ill.

Mullitex—Refractories. Walsh Refractories Corp., St. Louis, Mo.

Multiclone—Dust collectors. Western Precipitation Corp., Los Angeles, Calif.

Multiduty—Pulleys and sheaves. Gates Rubber Co., The, Denver, Colo.

Multifin—Radiation. American Radiator & Standard Sanitary Corp., Pittsburgh, Pa.

Multi-Panel—Air filters. American Air Filter Co., Inc., Louisville, Ky.

Multiport—Valves. American Radiator & Standard Sanitary Corp., Pittsburgh, Pa.

Multiseal—Gaskets. Goetze Gasket & Packing Co., Inc., New Brunswick, N. J.

Multitherm — Air conditioning units. Clarage Fan Co., Kalamazoo, Mich.

Multi-V—V-belts. Goodrich Co., B. F., Akron, O.

Multivane—Fans, blowers, unit heaters. B. F. Sturtevant Co., Boston, Mass.

Multi-Vent—Ceiling panels. Pyle-National Co., The, Chicago, Ill.

Multi-Wash—Dust collectors. Schneible Co., Claude B., Detroit, Mich.

Murco—Unit heaters. Murray Mfg. Co., D. J., Wausau, Wis.

Murex—Welding electrodes. Metal & Thermit Corp., New York, N. Y.

Murray—Radiation. American Radiator & Standard Sanitary Corp., Pittsburgh, Pa.

N-M-D — Valves. Lunkenheimer Co., Cincinnati, O.

N-R—Heat exchangers. National Radiator Co., The, Johnstown, Pa.

NYBCo Steelfin—Heating surface. New York Blower Co., Chicago, Ill.

Nalco — Boiler cleaning compounds, water treatment. National Aluminate Corp., Chicago, Ill.

National—Fans, furnaces, heaters. Magirl Foundry & Furnace Works, P. H., Bloomington, Ill.

National — Pumps. Austin-Mason Co., New York, N. Y.

National Champion — Air conditioning units, furnaces. Stainless & Steel Products Co., St. Paul, Minn.

Naturzone—Insulation. Wilson & Co., Chicago, Ill.

Nelson—Pumps. Haering Co., Inc., D. W., Chicago, Ill.

Nelson—Stokers. Heating Assurance, Inc., Spokane, Wash.

Nemo — Insulating cement. Smith & Kanzler Corp., Elizabeth, N. J.

Neverust — Exhaust heads. Straight Line Foundry & Machine Corp., Direct Separator Div., Syracuse, N. Y.

New Cyclone—Dust collectors. Kirk & Blum Mfg. Co., Cincinnati, O.

New Kathode — Electrodes. Lincoln Electric Co., Cleveland, O.

New Lightweld — Electrodes. Lincoln Electric Co., Cleveland, O.

Neware—Welding electrodes. Electric Arc, Inc., Newark, N. J.

Niagara—Meters. Buffalo Meter Co., Buffalo, N. Y.

Nibco—Fittings, joints, valves. Northern Indiana Brass Co., Elkhart, Ind.

Nickelend — Electrodes. Arcos Corp., Philadelphia, Pa.

Ni-Resist — Pipe. Walworth Co., New York, N. Y.

No-Drip—Insulation. Mortell Co., J. W., Kankakee, Ill.

Non-clog—Sewage ejectors and pumps. Chicago Pump Co., Chicago, Ill.

Non-clog—Pipe line strainers. Boylston Steam Specialty Co., Chicago, Ill.

Non-Clogging — Spray nozzles. Link-Belt Co., Chicago, Ill.

Non-Con-Dux — Cement, insulation. Wilson, Inc., Grant, Chicago, Ill.

Non-Flash — Brazing torches, welding and cutting apparatus. Torchweld Equipment Div., National Cylinder Gas Co., Chicago, Ill.

Non-Frost — Insulation. Keasbey & Mattison Co., Ambler, Pa.

Non-Sweat — Insulation. Keasbey & Mattison Co., Ambler, Pa.

No-Ox-Id—Protective coatings. Dearborn Chemical Co., Chicago, Ill.

Norblo—Dust collectors, fans, washers. Northern Blower Co., Cleveland, O.

Nordstrom—Valves. Merco-Nordstrom Valve Co., Pittsburgh, Pa.

No-Rivet—Regulators. Ohio Products Co., Cleveland, O.

Northwind—Unit air coolers. Pleasantaire Corp. of America, Washington, D. C.

Norwesco — Cement and compounds, boiler and radiator sealing compounds. Atlas Chemical Co., Marietta, O.

No-Site—Louvers and shutters. Waterloo Register Co., Waterloo, Ia.

No Streak — Registers. Rock Island Register Co., Rock Island, Ill.

No-Ve-U—Door ventilators. Waterloo Register Co., Waterloo, Ia.

Novoid—Insulation. Cork Import Corp., New York, N. Y.

Novus—Boilers. National Radiator Co., The, Johnstown, Pa.

Nu-Air—Air conditioning units. American Metal Products Co., Fort Worth, Texas.

Nu-Air—Fans. Meier Electric & Machine Co., Indianapolis, Ind.

Nu-Air—Ventilators. Milcor Steel Co., Milwaukee, Wis.

Nu-Alpina — Ventilators. Milcor Steel Co., Milwaukee, Wis.

Nudry—Cement. Pyrolite Products Co., Cleveland, O.

Nu-Grip—Shears and snips. Wiss and Sons Co., J., Newark, N. J.

Nu-Notch — Mushroom ventilators. Knowles Mushroom Ventilator Co., Montclair, N. J.

Nuvent—Ventilators. Aeolus Dickinson, Chicago, Ill.

Nu-Wood — Insulation. Wood Conversion Co., St. Paul, Minn.

OB—Valves. Ohio Brass Co., Mansfield, O.

O.E.F. — Preheaters, water heaters. Frank Heaters, Inc., Paterson, N. J.

OK—Motors. Marathon Electric Mfg. Corp., Wausau, Wis.

OK—Stocks and dies. Greenfield Tap & Die Corp., Greenfield, Mass.

OPW—Valves. Ohio Pattern Works & Foundry Co., Cincinnati, O.

Oakwood—Leather belting and v-belts. Baldwin Belting, Inc., New York, N. Y.

Octopus — Belting. Manheim Mfg. & Belting Co., Manheim, Pa.

Octopus — Welding fume collectors. Chelsea Fan & Blower Co., Inc., Irvington, N. J.

Ofeldt—Boilers, superheaters. Mears-Kane-Ofeldt, Inc., Philadelphia, Pa.

Oilbuster—Boiler cleaning compounds. Cannon Chemical Co., Everett, Mass.

Oil-Fifty—Boilers. Pierce Butler Radiator Corp., Syracuse, N. Y.

Oil-O-Matic — Oil burners. Williams Oil-O-Matic Heating Corp., Bloomington, Ill.

Okay Tred—Leather belting. Houghton & Co., E. F., Philadelphia, Pa.

Ol' Faithful — Humidifiers. Maid-O'-Mist, Inc., Chicago, Ill.

One Venturi — Heating systems. Taco Heaters, Inc., New York, N. Y.

Orangeburg — Fiber pipe. Fibre Conduit Co., Orangeburg, N. Y.

Oriflex — Valves. Dunham Co., C. A. Chicago, Ill.

Oswego—Cutters, punches, wrenches. International Nutyp Tool Co., Oswego, N. Y.

Ovaltube—Gas burners. Beck Engineering Combustion Kompany, St. Louis, Mo.

Oxweld—Welding rod, welding and cutting apparatus. Linde Air Products Co., The, New York, N. Y.

Ozite—Insulation. American Hair & Felt Co., Chicago, Ill.

PC—Air conditioning units. Buffalo Forge Co., Buffalo, N. Y.

PDQC — Pipe machines. Bignall & Keeler Machine Works, Edwardsville, Ill.

P & H—Welding electrodes. Harnischfeger Corp., Milwaukee, Wis.

P & H Hansen—Arc Welders. Harnischfeger Corp., Milwaukee, Wis.

P. I. V. Gear—Speed changers. Link-Belt Co., Philadelphia, Pa.

Paintgrip — Sheets. American Rolling Mill Co., The, Middletown, O.

Palco—Packing. Greene, Tweed & Co., New York, N. Y.

Palco Wood-Saferized—Insulation. Pacific Lumber Co., The, San Francisco, Calif.

Palmaire—Unit heaters. Palmer Mfg. Corp., Phoenix, Ariz.

Palmetto—Packing. Greene, Tweed & Co., New York, N. Y.

Palmetto Superheat — Gaskets and packing. Greene, Tweed & Co., New York, N. Y.

Par — Condensing units. Lynch Mfg. Corp., Defiance, O.

Paracoil — Heaters, preheaters, steam traps. Davis Engineering Corp., Elizabeth, N. J.

Paraline—Motor bases. Allis-Chalmers Mfg. Co., Milwaukee, Wis.

Parasol—Spray nozzles. Spraying Systems Co., Chicago, Ill.

Parko—Psychrometers. Parks-Cramer Co., Fitchburg, Mass.

Pathfinder—Belting. Goodyear Tire & Rubber Co., Akron, O.

Pax-Tite—Leather packing. Watson-Stillman Co., Roselle, N. J.

Pebco—Boilers. Pierce Butler Radiator Corp., Syracuse, N. Y.

Peer—Welders. Pier Equipment Mfg. Co., Benton Harbor, Mich.

Peerless—Dust collectors, humidifiers, air washers. New York Blower Co., Chicago, Ill.

Peerless — Pipe machines. Bignall & Keeler Machine Works, Edwardsville, Ill.

Penco—Plastic fittings, pipe and tubing. North Penn Co., New York, N. Y.

Penn-M-Co—Fittings. Penn Mfg. Corp. of Washington, Pa., Washington, Pa.

Perfection—Plates. Beaton & Cadwell Mfg. Co., New Britain, Conn.

Perfection—Valves. American District Steam Co., North Tonawanda, N. Y.

Permalined—Pipe. Jones & Laughlin Steel Corp., Pittsburgh, Pa.

Permat — Filters. Davies Air Filter Corp., New York, N. Y.

Permo-Aire—Filters. Air Devices, Inc., New York, N. Y.

Petro—Oil burners, water heaters. Petroleum Heat & Power Co., Stamford, Conn.

Pexto — Brakes, punches, shears, wrenches. Peck, Stow & Wilcox Co., Southington, Conn.

Phantom Doorman—Door controls. Yale & Towne Mfg. Co., Stamford, Conn.

Pierce-Firebox — Boilers. Ames Iron Works, Div. of Pierce Butler Radiator Corp., Oswego, N. Y.

Pilot—Motors. Smith Mfg. Co., Inc., F. A., Rochester, N. Y.

Pilot—Valves. Powell Co., Wm., Cincinnati, O.

Pipe Master — Pipe cutting machines. Oster Mfg. Co., Cleveland, O.

Pipemaster—Wrenches. Erie Tool Wks., Erie, Pa.

Pitco — Unions. Pittsburgh Valve & Fittings Corp., Barberton, O.

Pittsburgh — Radiator, unit heaters. Automatic Gas Equipment Co., Pittsburgh, Pa.

Pittsburgh-National — Meters. Pittsburgh Equitable Meter Co., Pittsburgh, Pa.

Plasti-Calk — Caulking compounds. Chamberlin Metal Weather Strip Co., Detroit, Mich.

Plastiseal — Cement and Compounds. Goetze Gasket & Packing Co., Inc., New Brunswick, N. J.

Plastite — Caulking compounds. U. S. Stoneware Co., New York, N. Y.

Plastoid—Caulking compounds, furnace cement. Plastic Products Co., Detroit, Mich.

Playford—Stokers. Rosedale Foundry & Machine Co., Pittsburgh, Pa.

Plexifin—Unit heaters. Bayley Blower Co., Milwaukee, Wis.

Plexiform—Fans. Bayley Blower Co., Milwaukee, Wis.

Pliatube — Plastic pipe and tubing. Carter Products Corp., Cleveland, O.

Plumrite—Pipe. Bridgeport Brass Co., Bridgeport, Conn.

Plymouth—Stokers. Clizbe Bros. Mfg. Co., Plymouth, Ind.

Pneumatronic — Electronic and pneumatic temperature control equipment. Johnson Service Co., Milwaukee, Wis.

Poeco — Insulation. Poe Co., C. W., Cleveland, O.

Polartron—Relays, regulators, switches. Minneapolis - Honeywell Regulator Co., Minneapolis, Minn.

Popular—Boilers. Pierce Butler Radiator Corp., Syracuse, N. Y.

Porex—Pipe line filters. General Motors Corp., Moraine Products Div., Dayton, O.

Porto-Power — Pipe benders. Blackhawk Mfg. Co., Milwaukee, Wis.

Pottstown—Pumps. Allen Billmyre Co., Mamaroneck, N. Y.

Power—Belting. Rhoads & Sons, J. E., Philadelphia, Pa.

Power Boy—Pipe cutting and threading machines. Oster Mfg. Co., Cleveland, O.

Power-Flex—Stokers. Link-Belt Co., Chicago, Ill.

Power Master — Boilers. Orr & Sembower, Inc., Reading, Pa.

Power Pak—Boilers. Orr & Sembower, Inc., Reading, Pa.

Precipitron — Air cleaners. Westinghouse Electric & Mfg. Co., Cleveland, O.

Premier—Boilers, heaters. National Radiator Co., The Johnstown, Pa.

Premier—Welding rod. American Steel & Wire Co., Cleveland, O.

Pre-Notch — Ducts and duct fittings. Gray Metal Products, Inc., Rochester, N. Y.

Pressuretrol — Regulators, switches. Minneapolis - Honeywell Regulator Co., Minneapolis, Minn.

Prestal — Pipe benders. Tal's Prestal Bender, Inc., Milwaukee, Wis.

Prestico—Caulking compounds, furnace cement. Presstite Engineering Co., St. Louis, Mo.

Prest-O-Lite—Leak detectors, torches. Linde Air Products Co., The, Unit of Union Carbide & Carbon Corp., New York, N. Y.

Prest-O-Weld — Welding and cutting apparatus. Linde Air Products Co., The, New York, N. Y.

Princo—Anemometers, gages, hygrometers, manometers, psychrometers, regulators, relays, thermometers, thermostats. Precision Thermometer and Instrument Co., Philadelphia, Pa.

Probestos—Gasket. Goetze Gasket & Packing Co., Inc., New Brunswick, N. J.

Protectomotor — Air filters. Dollinger Corp., Rochester, N. Y.

Protectorelay — Relays. Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.

Protectoring—Gaskets. Goetze Gasket & Packing Co., Inc., New Brunswick, N. J.

Proxlin—Enamels and lacquers. Acme White Lead & Color Works, Detroit, Mich.

Pryzoak — Belting. Graton & Knight Co., Worcester, Mass.

Pul-Air—Ventilators. Lyon, Conklin & Co., Inc., Baltimore, Md.

Pulling—Circulators, pumps. Columbus Steam Pump Works Co., Columbus, O.

Pulverzone—Stokers. American Coal Burner Co., Chicago, Ill.

Punkah—Louvers and shutters. Kelvin-White Co., Boston, Mass.

Purox—Electrodes, welding and cutting apparatus. Linde Air Products Co., The, Unit of Union Carbide & Carbon Corp., New York, N. Y.

Pyralux—Enamels and lacquers. du Pont de Nemours & Co. (Inc.), E. I., Fabrics & Finishes Dept., Wilmington, Del.

Pyrex — Glass pipe, gage and sight glasses, heat exchangers, nozzles. Corning Glass Wks., Corning, N. Y.

Pyro—Thermometers, recorders, regulators. Pyrometer Instrument Co., New York, N. Y.

Pyrofelt—Insulation. Mitchell & Smith, Inc., Detroit, Mich.

Pyroment—Cement. Keasbey & Mattison Co., Ambler, Pa.

Pyrotron—Recorders. Bailey Meter Co., Cleveland, O.

Q-Chrome—Refractories. Quigley Co., Inc., New York, N. Y.

QD—Sheaves. Worthington Pump & Machinery Corp., Harrison, N. J.

Q-Seal—Caulking compounds. Quigley Co., Inc., New York, N. Y.

Q-T—Insulation. Celotex Corp., The, Chicago, Ill.

QT—Unit heaters. Kisco Boiler & Engineering Co. St. Louis, Mo.

Quad—Cooling towers. Young Radiator Co., Racine, Wis.

Quad—Fans. Trade-Wind Motorfans, Inc., Los Angeles, Calif.

Quartzoid—Sprinkler heads. Grinnell Co., Inc., Providence, R. I.

Quiet May—Oil burners. May Oil Burner Corp., Baltimore, Md.

Quiet Zone—Blower wheels, fans. Palmer's Mfg. Corp., Phoenix, Ariz.

Quilt—Insulation. Cabot, Inc., Samuel, Boston, Mass.

Quintuplet—Valves. Maid-O'-Mist, Inc., Chicago, Ill.

RBC—Roller bearings. Roller Bearing Co. of America, Trenton, N. J.

RB Pressure—Pressure blowers. Western Blower Co., Seattle, Wash.

R & G—Grilles, registers. Register & Grille Mfg. Co., Brooklyn, N. Y.

R. I. 250—Unions. Rhode Island Fittings Co., Hillsgrove, R. I.

R-K—Combustion control systems, regulators, valves. Ruggles-Klingemann Mfg. Co., Salem, Mass.

R & M—Motors. Robbins & Myers, Inc., Springfield, O.

R & M Moyno—Pumps. Robbins & Myers, Inc., Springfield, O.

R-P Zeolite—Water tratment. Research Products Corp., Madison, Wis.

R. P. & C.—Fittings, valves. Reading-Pratt & Cady Div., American Chain & Cable Co., Inc., Bridgeport, Conn.

R-U-F—Fans. Reed Unit-Fans, Inc., New Orleans, La.

Race—Fans, heaters. Royal Air Conditioning Equipment Co., Alhambra, Calif.

Radialflow—Valves. Smolensky Valve Co., Inc., Cleveland, O.

Radiatherm—Valves. American Radiator & Standard Sanitary Corp., Pittsburgh, Pa.

Radi-Ion—Ionization apparatus. Montgomery Bros., San Francisco, Calif.

Radolite—Cement, refractories. Pyrolite Products Co., Cleveland, O.

Raintite — Ventilators. Aeolus Dickinson, Chicago, Ill.

Rajah—Packing. Johns-Manville, New York, N. Y.

Ramapo—Leather belting and v-belts. Baldwin Belting, Inc., New York, N. Y.

Ranarex—Analyzers, indicators, recorders. Permutit Co., New York, N. Y.

Rapid—Oil coolers. Bell & Gossett Co., Morton Grove, Ill.

Rapiduction — Pipe cutting machines. Oster Mfg. Co., Cleveland, O.

Rawl-Anchor — Bolts. Rawlplug Co., Inc., The, New York, N. Y.

Rawl-Drive—Bolts. Rawlplug Co., Inc., The, New York, N. Y.

Rawl-Taper—Bolts. Rawlplug Co., Inc., The, New York, N. Y.

Raydiant—Radiation. Weil-McLain Co., Chicago, Ill.

Reco—Accumulators, condensers, headers, heaters, preheaters, tanks, unit coolers. Richmond Engineering Co., Richmond, Va.

Reco—Controllers and starters, motors. Reynolds Electric Co., Chicago, Ill.

Reco Radi-Aire—Fans. Reynolds Electric Co., Chicago, Ill.

Record-O-Stat — Recorder - Controllers. Johnson Service Co., Milwaukee, Wis.

Recoy—Chillers, condensers, cooling surface, unit air conditioners and coolers. Refrigeration Economics Co., Inc., Canton, O.

Red—Operators, regulators, switches, valves. Cooper Co., Clark, Palmyra, N. J.

Red Devil—Cement. Pecora Paint Co., Philadelphia, Pa.

Red Diamond—Pipe. American District Steam Co., North Tonawanda, N. Y.

Red Flash—Traps. Ellis Drier Co., Chicago, Ill.

Red Head—Tongs. Billings & Spencer Co., Hartford, Conn.

Red Head—Traps. Ellis Drier Co., Chicago, Ill.

Red-Reading-Mercury — Hygrometers, psychrometers, thermometers. Palmer Co., Cincinnati, O.

Red Socket—Wrenches. Lowell Wrench Co., Worcester, Mass.

Red Top — Humidistats, thermostats. H-B Instrument Co., Philadelphia, Pa.

Red Top—Valves. Neptune Meter Co., New York, N. Y.

Red Top—Insulation. United States Gypsum Co., Chicago, Ill.

Redi—Stokers. General Machinery Co., Spokane, Wash.

Redi-Return—Pumps. American-Marsh Pumps, Inc., Battle Creek, Mich.

Redi-Vac — Pumps. American - Marsh Pumps, Inc., Battle Creek, Mich.

Reformend—Electrodes. Arcos Corp., Philadelphia, Pa.

Refrak° Screen—Gas burners. Selas Co., The, Philadelphia, Pa.

Rego—Welding and cutting apparatus. Universal Power Corp., Cleveland, O.

Rego—Torches, welding and cutting apparatus. National Cylinder Gas Co., Chicago, Ill.

Relatrol—Heating systems. Automatic Temperature Control Co., Inc., Philadelphia, Pa.

Reliance—Regulators. American Meter Co., Inc., New York, N. Y.

Reliance—Regulators. General Controls Co., Glendale, Calif.

Remco—Bases. Manley Products Corp., York, Pa.

Renewo — Valves. Lunkenheimer Co., Cincinnati, O.

Renu-Vent—Air filters. American Air Filter Co., Inc., Louisville, Ky.

Research—Belting. Graton & Knight Co., Worcester, Mass.

Reverbolite—Insulation. Celotex Corp., The, Chicago, Ill.

Rex—Blower wheels, fans. Air Controls, Inc., Cleveland, O.

Rex—Chain drives, couplings, nozzles, pillow blocks, pumps. Chain Belt Co., Milwaukee, Wis.

Rex-AC—Bearings. Air Controls, Inc., Cleveland, O.

Rex-Airate—Roof ventilators, blower wheels. Air Controls, Inc., Cleveland, O.

Rex-Flex—Ducts, tubing. Chicago Metal Hose Corp., Maywood, Ill.

Rexoil—Burners, heaters. Reif-Rexoil, Inc., Buffalo, N. Y.

Rexvane—Fans. Sturtevant Co., B. F., Boston, Mass.

Rex-Weld—Hose, pipe joints. Chicago Metal Hose Corp., Maywood, Ill.

Reyn-O-Cell — Insulation. Reynolds Metals Co., Richmond, Va.

Rhino—Caulking compounds. Pecora Paint Co., Philadelphia, Pa.

Richvar—Radiation. Richmond Radiator Co., Gas Products Div., Uniontown, Pa.

Ridgid—Pipe machines, wrenches, cutters, vises. Ridge Tool Co., Elyria, O.

Rifco 300—Unions. Rhode Island Fittings Co., Hillsgrove, R. I.

Rihco—Humidifiers. Rhode Island Humidifier & Ventilating Co., Boston, Mass.

Rip-Clean—Filters. Research Products Corp., Madison, Wis.

Rip-pl—Enamels and lacquers. Hilo Varnish Corp., Brooklyn, N. Y.

Ripple Tube—Cooling and heating surface. McQuay, Inc., Minneapolis, Minn.

Robinson—Brakes, punches. New Albany Machine Mfg. Co., New Albany, Ind.

Rocan—Copper sheets. Revere Copper and Brass, Incorporated, New York, N. Y.

Rocktex—Insulation. Carey Mfg. Co., Philip, Lockland, Cincinnati, O.

Rocop—Heaters. Rome-Turney Radiator Co., Rome, N. Y.

Rodpax—Packing. National Engineering Products, Inc., Washington, D. C.

Ro-Flo — Compressors. Allis-Chalmers Mfg. Co., Milwaukee, Wis.

Rolagrip — Couplings. Gustin Bacon Mfg. Co., Kansas City, Mo.

Roman Bronze — Welding rod. Revere Copper and Brass Incorporated, New York, N. Y.

Roofvane—Ventilators. Sturtevant Co., B. F., Boston, Mass.

Roof-Vent — Ventilators. Reed Unit-Fans, Inc., New Orleans, La.

Rotameter—Flow meters. Schutte & Koerting Co., Philadelphia, Pa.

Rotameter—Meters. Fischer & Porter Co., Hatboro, Pa.

Rota-Roll — Pumps. Sundstrand Machine Tool Co., Pump Div., Rockford, Ill.

Roto Blast—Furnaces. Moncrief Furnace Co., Atlanta, Ga.

Roto-Clone—Dust collectors. American Air Filter Co., Inc., Louisville, Ky.

Rotohood—Ventilators. Uno Ventilator Co., Cliftondale, Mass.

Rotojet — Spray nozzles. Binks Mfg. Co., Chicago, Ill.

Ro-Twin—Air compressors. Allis-Chalmers Mfg. Co., Milwaukee, Wis.

Roxite—Pipe. United States Stoneware Co., New York, N. Y.

Rubalt—Enamels and lacquers. Hague & Co., Inc., Alfred, Brooklyn, N. Y.

Rubyfluid—Solder. Ruby Chemical Co., Columbus, O.

Runwel—Packing. Greene, Tweed & Co., New York, N. Y.

Rusco—Insulation. Russell Co., F. C., Cleveland, O.

Rustbuster—Cleaning compounds. Cannon Chemical Co., Everett, Mass.

S-A—Feeders. Stephens-Adamson Mfg. Co., Aurora, Ill.

SA—Valves. Lunkenheimer Co., Cincinnati, O.

S. C.—Air heaters, gas burners. Surface Combustion, Toledo, O.

S-N—Air conditioning units, burners, fans, heaters, pumps, stokers. Scott-Newcomb, Inc., St. Louis, Mo.

S & P—Burners, governors, preheaters, regulators, strainers, valves. Staples & Pfeiffer, Ltd., San Francisco, Calif.

S. R. P.—Protective coatings. Sonneborn Sons, Inc., L., New York, N. Y.

Saf-Dry—Refrigerants. Liquid Carbonic Corp., The, Chicago, Ill.

Sal-Mo—Cement, insulation, packing. Sall Mountain Co., Chicago, Ill.

Sanidaire — Humidifiers. United States Air Conditioning Corp., Minneapolis, Minn.

Santosite—Water treatment. Monsanto Chemical Co., St. Louis, Mo.

Santrol—Registers. Tuttle & Bailey, Inc., New Britain, Conn.

Saran—Plastic pipe and tubing. Acadia Synthetic Products Div., Western Felt Works, Chicago, Ill.

Saran—Plastic pipe and tubing. Dow Chemical Co., Midland, Mich.

Saran — Plastic fittings and tubing. Hodgman Rubber Co., Framingham, Mass.

Saran — Plastic tubing. Skuttle Mfg. Co., Detroit, Mich.

Saunders — Pipe cutters. Erie Tool Works, Erie, Pa.

Sauter—Time switches. Cramer Co., Inc., R. W., The, Centerbrook, Conn.

Schwan—Gas burners. Jamieson Mfg. Co., Dallas, Texas.

Scotch Giant—Refrigerating compressors. General Electric Co., Air Conditioning and Commercial Refrigeration Divisions, Bloomfield, N. J.

Scroll-Pivoter—Shears. Wiss & Sons Co., J., Newark, N. J.

Scru-peller — Sewage ejectors and pumps. Chicago Pump Co., Chicago, Ill.

Seal Master—Bearings. Stephens-Adamson Mfg. Co., Aurora, Ill.

Seal-Less — Compressors. Westinghouse Electric & Mfg. Co., Springfield, Mass.

Seal-Rite — Cement and compounds. Macksons Co., New York, N. Y.

Security — Caulking compounds. National Mfg. Corp., Tonawanda, N. Y.

Segweld—Pipe fittings. Gustin Bacon Mfg. Co., Kansas City, Mo.

Seigelite — Gaskets. Johns-Manville, New York, N. Y.

Seismo-Dampers—Bases. Korfund Co., Long Island City, N. Y.

Sells—Bearings. Royersford Foundry & Machine Co., Royersford, Pa.

Sensatherm — Thermostats. Mercoid Corp., Chicago, Ill.

Sensitrol — Relays. Weston Electrical Instrument Corp., Newark, N. J.

Sentinel—Pumps. Red Jacket Mfg. Co., Davenport, Ia.

Sentry—Smoke alarms. Boiler Room Equipment, Inc., New York, N. Y.

Serrabestos—Gaskets. Goetze Gasket & Packing Co., Inc., New Brunswick, N. J.

Service—Packing. Johns-Manville, New York, N. Y.

Serviron—Coatings. Saverite Engineering Co., Hoboken, N. J.

Sesure — Gages. Yarnall-Waring Co., Philadelphia, Pa.

"77" — Pipe coverings. Eagle-Picher Lead Co., Cincinnati, O.

"78"—Traps. Webster & Co., Warren, Camden, N. J.

Shawco—Bends, headers. Shaw Co., Benjamin F., Wilmington, Del.

Shelby — Tubing. National Tube Co., United States Steel Corp. Sub., Pittsburgh, Pa.

Shield-Arc — Electrodes, arc welders Lincoln Electric Co., Cleveland, O.

Shut-O-Vent — Louvers and shutters Reed Unit-Fans, Inc., New Orleans, La.

Silent Air — Fans. Belanger Fan & Blower Co., Detroit, Mich.

Silentaire — Window ventilator units. Berger Mfg. Div., Republic Steel Corp., Canton, O.

Silentblu—Gas burners. Beck Engineering Combustion Kompany, St. Louis, Mo.

Silentvane — Fans. Sturtevant Co., B. F., Boston, Mass.

Sil-Fos—Solder. Handy & Harman, New York, N. Y.

Silicair—Insulation. Western Silicair Products, Inc., Burbank, Calif.

Silverlink—Chain drives. Link-Belt Co., Indianapolis, Ind.

Silverseal—Packing. Goetze Gasket & Packing Co., Inc., New Brunswick, N. J.

Silverstreak — Chain drive. Link-Belt Co., Indianapolis, Ind.

Silver Stream—Spray nozzles. Skinner Irrigation Co., Troy, O.

Silvertop—Eliminators, traps. Anderson Co., V. D., The, Cleveland, O.

Simplex — Gages. Viking Pump Co., Cedar Falls, Ia.

Simplex—Pipe vises. Desmond-Stephan Mfg. Co., Urbana, O.

Simplex — Regulators. Ohio Products Co., Cleveland, O.

Simplex — Regulators, tanks. Bell & Gossett Co., Morton Grove, Ill.

Sim-Trol—Controls. Simplex Mfg. Co., Fond du Lac, Wis.

Sirocco—Blowers, dust collectors, fans, unit air conditioners, unit air coolers, unit air humidifiers, air washers. American Blower Corp., Detroit, Mich.

Skil Drill—Drills. Skilsaw, Inc., Chicago, Ill.

Skip-Tooth—Dies. Nye Tool & Machine Co., Chicago, Ill.

Slugin—Bolts. Star Expansion Bolt Co., New York, N. Y.

Smith-Midget—Direct radiation. Smith Co., Inc., H. B., Westfield, Mass.

Smith-Mills—Boilers. Smith Co., Inc., H. B., Westfield, Mass.

Snapin—Bolts. Star Expansion Bolt Co., New York, N. Y.

Snap-Rite—Ducts and duct fittings. Gray Metal Products, Inc., Rochester, N. Y.

Sno-Breze—Air conditioning units, cooling surface. Palmer Mfg. Corp., Phoenix, Ariz.

Snug—Radiation. Weil-McLain Co., Chicago, Ill.

Softweld—Electrodes. Lincoln Electric Co., Cleveland, O.

Solray—Radiation. Weil-McLain Co., Chicago, Ill.

Sol-vet—Cleaning compounds, water treatment. Anderson-Stolz Corp., Kansas City, Mo.

Sono-O-Seal—Insulation. General Insulating Products Co., Brooklyn, N. Y.

Soundliner—Insulation. Baldwin-Hill Co., Trenton, N. J.

Sovereign—Packing. Darcoid Co., Inc., New York, N. Y.

Spatter Film—Electrodes. Lincoln Electric Co., Cleveland, O.

Special X—Solder. Industrial Service Laboratories, Milwaukee, Wis.

Speed Heater—Unit heaters. Sturtevant Co., B. F., Boston, Mass.

Speedarc—Electrodes. Universal Power Corp., Cleveland, O.

Sphero—Plug valves. Fairbanks Co., New York, N. Y.

Spider Web—Air filters. Wilson & Co., Chicago, Ill.

Spiradome—Spray nozzles. Fluor Corp., Ltd., The, Los Angeles, Calif.

Spiralwound—Gaskets. Goetze Gasket & Packing Co., Inc., New Brunswick, N. J.

Spirodome—Spray nozzles. Cooling Tower Co., Inc., The, Div. of the Fluor Corp., Ltd., New York, N. Y.

Spirotallic—Gaskets. Johns-Manville, New York, N. Y.

Spirovane—Fans. Western Blower Co., Seattle, Wash.

Sporlan—Valves. Spoehrer-Lange Co., St. Louis, Mo.

Spraco—Nozzles, separators, strainers, washers. Spray Engineering Co., Somerville, Mass.

Spra-Rite—Nozzles. Binks Mfg. Co. Chicago, Ill.

Spray-Acoustic—Insulation. Sprayo-Flake Co., Chicago, Ill.

Springin—Bolts. Star Expansion Bolt Co., New York, N. Y.

Stabilflo—Valves. Foxboro Co., Foxboro, Mass.

Stable-Arc—Electrodes, arc welders. Lincoln Electric Co., Cleveland, O.

Stacon—Regulators, valves. Edison, Inc., Thomas A., Instrument Div., West Orange, N. J.

Sta-Gloss—Steel sheets. Jessop Steel Co., Washington, Pa.

Staidarc—Electrodes. Universal Power Corp., Cleveland, O.

Stainarc—Electrodes. Universal Power Corp., Cleveland, O.

Stainlend—Electrodes. Arcos Corp., Philadelphia, Pa.

Stainless—Cement and compounds. Grinnell Co., Inc., Providence, R. I.

Stainweld—Electrodes. Lincoln Electric Co., Cleveland, O.

Standforated—Grilles. Standard Stamping & Perforating Co., Chicago, Ill.

Star—Ventilators. Merchant & Evans Co., Philadelphia, Pa.

Staynew—Filters. Dollinger Corp., Rochester, N. Y.

Starin—Bolts. Star Expansion Bolt Co., New York, N. Y.

Steelok—Packing. Goetze Gasket & Packing Co., Inc., New Brunswick, N. J.

Sterilamp—Lamps. Westinghouse Electric & Mfg. Co., Bloomfield, N. J.

Sterlco—Controls, eliminators, pumps, strainers, heating systems, traps, valves. Sterling, Inc., Milwaukee, Wis.

Sterling—Compressors, condensers, valves. Reynolds Mfg. Co., Inc., Springfield, Mo.

Stictite—Cement. Refractory & Insulation Corp., New York, N. Y.

Stokerator—Stokers. Northern Steel & Stoker Corp., Peoria, Ill.

Stokerelay—Relays. Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.

Stokol—Stokers, water heaters. Schwitzer-Cummins Co., Indianapolis, Ind.

Streamaire—Unit heaters, radiation, cooling surface. Young Radiator Co., Racine, Wis.

Striatube—Plastic pipe and tubing. Carter Products Corp., Cleveland, O.

Stronghold—Belting. Rhoads & Sons, J. E., Philadelphia, Pa.

Stud-Pak—Insulation. United States Mineral Wool Co., Chicago, Ill.

Sullarc—Electrodes. Universal Power Corp., Cleveland, O.

Sunray—Boilers, radiation. United States Radiator Corp., Detroit, Mich.

Super Air Screws—Fans. Marathon Electric Mfg. Corp., Wausau, Wis.

Super Cold Fin—Cooling surface. Rempe Co., Chicago, Ill.

Super Seal—Fittings. Grinnell Co., Inc., Providence, R. I.

Super "66"—Insulation. Eagle-Picher Lead Co., Cincinnati, O.

Super 7—V belts. Allis-Chalmers Mfg. Co., Milwaukee, Wis.

Super Silverton—Traps. Anderson Co., V. D., The, Cleveland, O.

Super Thermo Stucco—Cement. Chicago Fire Brick Co., Chicago, Ill.

Super X—Copper sheets. Western Cartridge Co., Brass Mill Div., East Alton, Ill.

Super X—Coatings. Nelson Mfg. Co., B. F., Minneapolis, Minn.

Supercord—V belts. Browning Mfg. Co., Inc., Maysville, Ky.

Supercutno—Packing. Greene, Tweed & Co., New York, N. Y.

Super-deLavaud—Pipe. U. S. Pipe & Foundry Co., Burlington, N. J.

Superector—Wrenches. Williams & Co., J. H., Buffalo, N. Y.

Superex—Insulation. Johns-Manville, New York, N. Y.

Super-Fan—Fan blades. Norwin Co., Freeport, Ill.

Superflex—Drives. Gates Rubber Co., The, Denver, Colo.

Superheat—Gas burners. Selas Co., The Philadelphia, Pa.

Superior—Fans. American Foundry & Furnace Co., Bloomington, Ill.

Superior—Wrenches. Williams & Co., J. H., Buffalo, N. Y.

Super-Power—Drives. Baldwin Belting, Inc., New York, N. Y.

Superratchet—Ratchet Wrenches. Williams & Co., J. H., Buffalo, N. Y.

Superrench—Wrenches. Williams & Co., J. H., Buffalo, N. Y.

Super-S—Gages. Klingerit, Inc., New York, N. Y.

Supersocket—Wrenches. Williams & Co., J. H., Buffalo, N. Y.

Supertan—Leather belting and v-belts. Baldwin Belting, Inc., New York, N. Y.

Supertemp—Insulation. Eagle-Picher Lead Co., Cincinnati, O.

Supertherm—Systems. Ross Engineering Corp., J. O., New York, N. Y.

Sure Hot—Heaters. Little Mfg. Co., M. S., Hartford, Conn.

Sure Return—Condensation return pumps. Chicago Pump Co., Chicago, Ill.

Surevent—Valves. Gorton Heating Corp., Cranford, N. J.

Sureweld—Electrodes. National Cylinder Gas Co., Chicago, Ill.

Surlock—Registers. Tuttle & Bailey, Inc., New Britain, Conn.

Sweet's—Exhaust heads. Straight Line Foundry & Machine Corp., Direct Separator Div., The, Syracuse, N. Y.

Swendeman—Air separators. Leavitt Machine Co., Orange, Mass.

Sylphon—Bellows, joints, operators, regulators, valves. Fulton Sylphon Co., Knoxville, Tenn.

Sylphon—Traps, valves. Webster & Co., Warren, Camden, N. J.

Synchro-Lectric—Viscosimeters. Brookfield Engineering Laboratories, Sharon, Mass.

Synchro-Meter—Meters. Bailey Meter Co., Cleveland, O.

Synchron—Motors. Hansen Mfg. Co., Inc., Princeton, Ind.

Synchrotie—Recorders. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

Syncretizer—Unit ventilators. Nesbitt, Inc., John J., Philadelphia, Pa.

T.T.—Smoke guns. Hill, E. Vernon, Chicago, Ill.

Tabasco—Water heaters. Kewanee Boiler Corp., Kewanee, Ill.

Tag—Humidistats, hygrometers, manometers, meters, psychrometers, recorders, regulators, thermometers, traps, valves. Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.

Tampico—Air filters. Chicago Filter Co., Joliet, Ill.

Tampin—Bolts. Star Expansion Bolt Co., New York, N. Y.

Tank-O-Meter—Gages. Uehling Instrument Co., Paterson, N. J.

Tanktrol—Regulators. Automatic Control Co., St. Paul, Minn.

Tannate—Belting, packing. Rhoads & Sons, J. E., Philadelphia, Pa.

Tanseal—Packing. Goetze Gasket & Packing Co., Inc., New Brunswick, N. J.

Techni-Louvre—Vanes. Waterloo Register Co., Waterloo, Ia.

Techni-Trol—Dampers. Waterloo Register Co., Waterloo, Ia.

Techni-Turn—Vanes. Waterloo Register Co., Waterloo, Ia.

Teksag Colloid—Boiler compounds. American Teksag Products Co., Inc., Mount Vernon, N. Y.

Televisor—Gages. Schutte & Koerting Co., Philadelphia, Pa.

Tellevel—Switches. Stephens-Adamson Mfg. Co., Aurora, Ill.

Teltru—Anemometers, gages. Hill, E. Vernon, Chicago, Ill.

Tem-Clock (Electric)—Time switches. Penn Electric Switch Co., Goshen, Ind.

Temlok—Insulation. Armstrong Cork Co., Lancaster, Pa.

Temperator—Unit air conditioners. Dunham Co., C. A., Chicago, Ill.

Tempryte—Windows. Truscon Steel Co., Youngstown, O.

Temtrol—Thermostats. Penn Electric Switch Co., Goshen, Ind.

Tensulate—Cement, insulation. Tennessee Products Corp., Nashville, Tenn.

Texrope—V-belt drives, pulleys, v-belts. Allis-Chalmers Mfg. Co., Milwaukee, Wis.

Texslide—Motor bases. Allis-Chalmers Mfg. Co., Milwaukee, Wis.

Tharco—Cement. The Armstrong Co., Detroit, Mich.

Thawzone—Dehydrant and acid neutralizer. Highside Chemicals Co., Newark, N. J.

Therhumiter—Thermometers. Weksler Thermometer Corp., New York, N. Y.

Thermalfin—Unit coolers. Thermal Co., Inc., Milwaukee, Wis.

Thermalfuel—Furnaces. Beck Engineering Combustion Kompany, St. Louis, Mo.

Thermascrete—Refractories. Munn and Steele, Inc., Newark, N. J.

Thermax—Insulation. Celotex Corp., The, Chicago, Ill.

Thermek—Heating and cooling surface. Peerless of America, Inc., Chicago, Ill.

Thermidaire—Burners, furnaces, heaters. Campbell Heating Co., E. K., Kansas City, Mo.

Thermix—Dust collector. Prat-Daniel Corp., Port Chester, N. Y.

Thermo—Expansion valves. Alco Valve Co., St. Louis, Mo.

Thermo — Heaters. American Furnace Co., St. Louis, Mo.

Thermochek—Controls. Bell & Gossett Co., Morton Grove, Ill.

Thermo-Draulic — Regulators. Perfex Corp., Milwaukee, Wis.

Thermoflex — Strainers, heating systems, traps, valves. Cashin Co., W. D., Boston, Mass.

Thermoflo—Valves. Bell & Gossett Co., Morton Grove, Ill.

Thermo-Flow—Heat exchangers. Schubert-Christy Corp., Indio, Calif.

Thermogage — Thermometers. Hotstream Heater Co., Cleveland, O.

Thermogas — Furnaces. Beck Engineering Combustion Kompany, St. Louis, Mo.

Thermoguide — Thermometers. Taylor Instrument Companies, Rochester, N. Y.

Thermohm — Psychrometers. Leeds & Northrup Co., Philadelphia, Pa.

Thermoil — Furnaces. Beck Engineering Combustion Kompany, St. Louis, Mo.

Thermolator—Valves. Triplex Heating Specialty Co., Peru, Ind.

Thermopane—Windo[illegible]y-Owens Ford Glass Co., Tol[illegible] O.

Therm-o-tile—Conduit. Porter & Co., Inc., H. W., Newark, N. J.

Thermotrol—Valves. Sterling Engineering Co., Milwaukee, Wis.

Thermovent—Unit ventilators. Nesbitt, Inc., John J., Philadelphia, Pa.

Thermovoir — Water heaters. Bell & Gossett Co., Morton Grove, Ill.

Thin Man—Registers. Register & Grille Mfg. Co., Inc., Brooklyn, N. Y.

Thor—Belting. Goodyear Tire & Rubber Co., Akron, O.

Thor—Drills, pumps, reamers, shears. Independent Pneumatic Tool Co., Chicago, Ill.

Thorobred—V belts and v belt drives. Dayton Rubber Mfg. Co., Dayton, O.

Thredolets—Fittings. Bonney Forge & Tool Wks., Allentown, Pa.

Thrift—Switches. Tork Clock Co., Inc., Mt. Vernon, N. Y.

Throway—Air filters. American Air Filter Co., Inc., Louisville, Ky.

Thy-mo-trol — Adjustable speed electronic motor drive. General Electric Co., Schenectady, N. Y.

Ti-Compact — Boilers. Titusville Iron Works Co., Titusville, Pa.

Ticone—Boilers. Titusville Iron Works Co., Titusville, Pa.

Time Saver—Damper regulators. Goese Mfg. Co., Milwaukee, Wis.

Timercoid — Time switches. Mercoid Corp., Chicago, Ill.

Timerelay—Relays. Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.

Timetrol (Manual) — Time switches. Penn Electric Switch Co., Goshen, Ind.

Tin-Ezy—Coatings. Johnson Co., Lloyd S., Chicago, Ill.

Tin-Loy — Solder. Eagle-Picher Lead Co., Cincinnati, O.

Tiny—Traps. Nason Co., Detroit, Mich.

Tiscot—Boilers. Titusville Iron Wks. Co., Titusville, Pa.

Titan—Traps. Nason Co., Detroit, Mich.

Tite — Caulking compounds. Krehbiel Co., J. H., Chicago, Ill.

Tite Seal—Cement and compounds. Radiator Specialty Co., Charlotte, N. C.

Tom Thumb — Pipe machines. Oster Mfg. Co., Cleveland, O.

Toncan—Pipe, sheets. Republic Steel Corp., Cleveland, O.

Toncanarc — Electrodes. Universal Power Corp., Cleveland, O.

Toolweld—Electrodes. Lincoln Electric Co., Cleveland, O.

Top-Notch — Tools. Jessop Steel Co., Washington, Pa.

Torkflash—Wrenches. Blackhawk Mfg. Co., Milwaukee, Wis.

Torqometer — Torque indicating wrenches. Snap-On Tools Corp., Kenosha, Wis.

Transite — Conduit, pipe, refractories, sheets and board. Johns-Manville, New York, N. Y.

Trans-Lux — Enamels and lacquers. Hilo Varnish Corp., Brooklyn, N. Y.

Transparent — Analyzers, gages, manometers. Dwyer Mfg. Co., F. W., Chicago, Ill.

Transweld—Electrodes. Lincoln Electric Co., Cleveland, O.

Trap-Dri — Dehydrators. Automatic Products Co., Milwaukee, Wis.

Trap-it — Filters. Automatic Products Co., Milwaukee, Wis.

Trap Nest — Insulation. Wilson, Inc., Grant, Chicago, Ill.

Tray—Cooling towers, condensers. New England Cooling Tower Co., Boston, Mass.

Treet-O-Control—Water treatment. % Proportioneers, Inc. %, Providence, R. I.

Treet-O-Unit — Pumps. % Proportioneers, Inc. %, Providence, R. I.

Triad—Stocks and dies. Nye Tool & Machine Co., Chicago, Ill.

Tri-Clad—Motors. General Electric Co., Schenectady, N. Y.

Trident—Meters. Neptune Meter Co., New York, N. Y.

Tri-Flux—Solder. Wolfe-Kote Co., Sheboygan, Wis.

Trimo—Cutters, tongs, vises, wrenches. Trimont Mfg. Co., Boston, Mass.

Trimo — Cutters. Erie Tool Works, Erie, Pa.

Triple-A—Enamels and lacquers, protective coatings. Quigley Co., Inc., New York, N. Y.

TripleDuty—Boilers. Bass Foundry & Machine Co., Ft. Wayne, Ind.

Triple Duty—Heating systems. Bell & Gossett Co., Morton Grove, Ill.

Triplex—Stocks and dies. Nye Tool & Machine Co., Chicago, Ill.

Tripl-Mix—Cement. Krehbiel Co., J. H., Chicago, Ill.

Tri-Rotor—Pumps. Yale & Towne Mfg. Co., Stamford, Conn.

Tri-Sli—Dampers. Tuttle & Bailey, Inc., New Britain, Conn.

Tri-trol—Regulators, switches, thermostats. Marsh Corp., Jas. P., Chicago, Ill.

Triumph—Gaskets. Goetze Gasket & Packing Co., Inc., New Brunswick, N. J.

Trojan—Boilers. Burnham Boiler Corp., Irvington, N. Y.

Truflex—Bi-metals. General Plate Div., Metals & Controls Corp., Attleboro, Mass.

Trulradiant — Gas burners. Sullivan Valve & Engineering Co., Butte, Mont.

Try-Me—Regulators, strainers, valves. Tryco Products, Inc., Westfield, Mass.

Tube-Loy—Lead alloy tubing. American Smelting & Refining Co., New York, N. Y.

Tuf-flex — Gage and sight glasses. Libbey-Owens Ford Glass Co., Toledo, Ohio.

Tuf-On—Protective coatings. Wipe-On Corp., New York, N. Y.

Tulox—Plastic pipe and tubing. Extruded Plastics, Inc., Norwalk, Conn.

Turbo — Air washers, spray nozzles. Bayley Blower Co., Milwaukee, Wis.

Turbo Vane—Fans and blowers. B. F. Sturtevant Co., Boston, Mass.

Turret — Pumps. Yeomans Bros. Co., Chicago, Ill.

Tuway—Strainers. Wright-Austin Co., Detroit, Mich.

20th Century—Bearings. Roller Bearing Co. of America, Trenton, N. J.

Twin Contact—Controls. Perfex Corp., Milwaukee, Wis.

Twin G-Fin — Preheaters. Griscom-Russell Co., The, New York, N. Y.

Two Way—Dampers. Tuttle & Bailey, Inc., New Britain, Conn.

Tygon — Protective coatings, plastic tubing. U. S. Stoneware Co., New York, N. Y.

Tylox—Pipe couplings. United States Stoneware Co., New York, N. Y.

Tymit—Switches. Tork Clock Co., Inc., Mt. Vernon, N. Y.

Type ME—Blower wheels, fans. New York Blower Co., Chicago, Ill.

Tytecote — Insulation. Specialty Converters, Inc., East Braintree, Mass.

UAC—Unit air conditioners. Burnham Boiler Corp., Irvington, N. Y.

U. F. S.—Clamps. Grinnell Co., Inc., Providence, R. I.

U. S.—Unions. United Superior Union Co., Inc., Brooklyn, N. Y.

U. S.—Valves. Powell Co., Wm., Cincinnati, O.

U-S-S—Shapes, sheets. Columbia Steel Co., San Francisco, Calif.

USS—Sheets, structural shapes. Tennessee Coal, Iron & Railroad Co., Birmingham, Ala.

U. S. Airco — Air conditioning equipment, speed changers. United States Air Conditioning Corp., Minneapolis, Minn.

UTA—Pumps. American-Marsh Pumps, Inc., Battle Creek, Mich.

U-Loy—Sheets. Republic Steel Corp., Cleveland, O.

Unaflo — Steam engines. Ames Iron Works, Div. of Pierce Butler Radiator Corp., Oswego, N. Y.

Unamatic — Automatic arc welding equipment. Una Welding, Inc., Cleveland, O.

Unarco—Insulation. Union Asbestos & Rubber Co., Cicero, Ill.

Unibestos—Insulation. Union Asbestos & Rubber Co., Cicero, Ill.

Unicoils—Air conditioning unit. Clarage Fan Co., Kalamazoo, Mich.

Unicool—Humidifiers, unit air conditioners, unit air humidifiers, air washers. Betz Engineering Co., Kansas City, Mo.

Uni-fin—Grilles, registers. Barber-Colman Co., Rockford, Ill.

Uni-flo—Air diffusers, dampers, grilles. Barber-Colman Co., Rockford, Ill.

Union—Valves. Powell Co., Wm., Cincinnati, O.

Uniplastic—Furnace and insulating cement. Robinson Insulation Co., Great Falls, Mont.

Unisorb — Bases and pads, insulation. Felters Co., Inc., Boston, Mass.

Unitaire—Unit air conditioners. Westinghouse Electric & Mfg Co., Springfield, Mass.

Unitank—Air conditioning units. Betz Engineering Co., Kansas City, Mo.

Unitem—Heaters. Bell & Gossett Co., Morton Grove, Ill.

Unitherm—Unit heaters and coolers. Clarage Fan Co., Kalamazoo, Mich.

Unitrol—Regulators, switches, thermostats. Marsh Tritrol Co., Chicago, Ill.

Universal—Benders. Hossfeld Mfg. Co., Winona, Minn.

Universal—Air filters. Hugo Mfg. Co., West Duluth, Minn.

Universal — Cast iron pipe. Central Foundry Co., New York, N. Y.

Universal—Centrifugal pumps. Bell & Gossett Co., Morton Grove, Ill.

Universal—Gages. Rochester Mfg. Co., Inc., Rochester, N. Y.

Universal—Gas and oil burners. Mettler Co., Lee B., Los Angeles, Calif.

Universal — Packing. Johns-Manville, New York, N. Y.

Universal—Pipe cutters. Nye Tool & Machine Co., Chicago, Ill.

Universal—Regulators. Dockson Corp., Detroit, Mich.

Universal—Vibration eliminators. Vibration Engineering Co., The, New York, N. Y.

Universal Unaflow — Engines. Skinner Engine Co., Erie, Pa.

Upson—Bolts and studs. Republic Steel Corp., Bolt & Nut Div., Cleveland, O.

Utica—Radiation. International Heater Co., Utica, N. Y.

Utility — Compressors. Schramm, Inc., West Chester, Pa.

Utilus—Fans. Hirschman Co., W. F. Buffalo, N. Y.

V-Air—Odor adsorbers. Vapor Chemical Corp., New York, N. Y.

Vacu-Draft — Blowers. Muncie Gear Wks., Inc., Muncie, Ind.

Vacuumstat — Switches. Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.

Valcalox — Damper regulators. Young Regulator Co., Cleveland, O.

Valpit — Unions. Pittsburgh Valve & Fittings Corp., Barberton, O.

Valvactor—Valve operators. Foxboro Co., Foxboro, Mass.

Vapor-seal — Insulation. Celotex Corp., The, Chicago, Ill.

Vaporstat — Switches. Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.

Varipitch—Pulleys and sheaves. Gates Rubber Co., The, Denver, Colo.

Vari-Pitch — Speed changers. Allis-Chalmers Mfg. Co., Milwaukee, Wis.

Vedoc—Enamels and lacquers. Ferro-Enamel Corp., Liquid Plastics Div., Cleveland, O.

Veelos—V-belts. Manheim Mfg. & Belting Co., Manheim, Pa.

Velometer—Air velocity meters. Illinois Testing Laboratories, Inc., Chicago, Ill.

Velvet—Cement. Keasbey & Mattison Co., Ambler, Pa.

Vent-Vac—Heating systems. Anderson Products, Inc., Cambridge, Mass.

Vento — Heating surface. American Radiator & Standard Sanitary Corp., Pittsburgh, Pa.

Vento—Traps. Haines & Co., William S., Philadelphia, Pa.

Vent-Rite—Air valves. Anderson Products, Inc., Cambridge, Mass.

Ventura—Fans. American Blower Corp., Detroit, Mich.

Venturafin — Unit heaters. American Blower Corp., Detroit, Mich.

Venturi — Fan housings. Commercial Shearing & Stamping Co., Youngstown, O.

Venturi — Meters. Builders-Providence, Inc., Div. of Builders Iron Foundry, Providence, R. I.

Venturi-Flo — Air diffusers. Barber-Colman Co., Rockford, Ill.

Verco—Insulating cement. Nelson Mfg. Co., B. F., Minneapolis, Minn.

Vermiculite — Insulation. International Vermiculite Co., Springfield, Ill.

Vernier-Set—Time switches. Automatic Temperature Control Co., Inc., Philadelphia, Pa.

Vertiflow—Unit heaters. Young Radiator Co., Racine, Wis.

Vertivent—Ventilators. Young Radiator Co., Racine, Wis.

Vescote—Coatings. Vesco Corp., New York, N. Y.

V-Flat—Pulleys and sheaves. Dayton Rubber Mfg. Co., Dayton, O.

Vibracork — Bases. Armstrong Cork Co., Lancaster, Pa.

Vibro-Bar—Bases and pads. Korfund Co., Long Island City, N. Y.

Vibro-Dampers — Bases. Korfund Co., Long Island City, N. Y.

Vibro Insulators—Bases. Goodrich Co., B. F., Akron, O.

Vibro-Insolator—Bases and pads. Korfund Co., Long Island City, N. Y.

Victor — Regulators. Atlas Valve Co., Inc., Newark, N. J.

Victor — Steam traps. Wright-Austin Co., Detroit, Mich.

Victory—Registers. Register & Grille Mfg. Co., Inc., Brooklyn, N. Y.

Vim—Gaskets, leather packing. Houghton & Co., E. F., Philadelphia, Pa.

Vim Tred—Leather belting. Houghton & Co., E. F., Philadelphia, Pa.

Vistand—Vise stands. Armstrong Mfg. Co., Bridgeport, Conn.

Vitalaire—Air conditioning units. Ice Cooling Appliance Corp., Morrison, Ill.

Vitalloy—Wrenches. Billings & Spencer Co., Hartford, Conn.

Vitra-Carlite — Enamels and lacquers. Hilo Varnish Corp., Brooklyn, N. Y.

Vitriram—Furnace cement. U. S. Stoneware Co., New York, N. Y.

V-Meth-L — Refrigerant. Virginia Smelting Co., West Norfolk, Va.

Voladjuster — Dampers. Barber-Colman Co., Rockford, Ill.

Volcano—Ventilators. Iwan Brothers, South Bend, Ind.

Volocitrol — Louvers, regulators. Barber-Colman Co., Rockford, Ill.

Vol-U-Trol — Dampers. Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.

Vortex—Pumps. Lawrence Pump & Engine Co., Lawrence, Mass.

Vortex—Nozzles. Phillips Cooling Tower Co., Inc., New York, N. Y.

V-tite — Gaskets. Goetze Gasket & Packing Co., Inc., New Brunswick, N. J.

V-to-V—Pulleys and sheaves. Dayton Rubber Mfg. Co., Dayton, O.

Vulcalock—Fittings, pipe, tanks, valves. Goodrich Co., B. F., Akron, O.

Vulcan—Stands, tongs, vises. Williams & Co., J. H., Buffalo, N. Y.

Vulcan — Unions. Rockwood Sprinkler Co., Worcester, Mass.

Vulco — Belts, drives, pulleys. Gates Rubber Co., Denver, Colo.

WHS—Couplings, pulleys and sheaves, reducers. Smith, Inc., Winfield H., Springfield, N. Y.

WJ—Boiler cleaning compound. Radiator Specialty Co., Charlotte, N. C.

W. & McD.—Strainers, valves. Watson & McDaniel Co., Philadelphia, Pa.

W-S—Fittings. Watson-Stillman Co., Roselle, N. J.

W & T—Anemometers, feeders. Wallace & Tiernan Co., Inc., Belleville, N. J.

W-W—Pipe hangers. Western Wire Products Co., St. Louis, Mo.

Walco-Parmelee—Wrenches. Walworth Co., New York, N. Y.

Wallvane—Fans. Sturtevant Co., B. F., Hyde Park, Boston, Mass.

Walseal Silbraz—Fittings, valves. Walworth Co., New York, N. Y.

Warco—Refractories. Walsh Refractories Corp., St. Louis, Mo.

Warco—Valves. Bridgeport Brass Co., Bridgeport, Conn.

Wat-a-mat—Water meters. Pfening Co., Fred D., Columbus, O.

Watco—Cooling towers, spray nozzles, spraying systems. Water Cooling Corp., New York, N. Y.

Water-Boy — Feeders. Maid-O'-Mist, Inc., Chicago, Ill.

Waterfilm—Heating boilers. Koven & Bro., Inc., L. O., Jersey City, N. J.

Water-Ray-Trola — Heaters. Ray Oil Burner Co., San Francisco, Calif.

Weaco—Preheaters, thermostats. Warren Electric Appliance Co., Warren, Pa.

Wear-Proof — Pumps. Schneible Co., Claude B., Detroit, Mich.

Wearweld—Electrodes. Lincoln Electric Co., Cleveland, O.

Weathermaker—Unit air conditioners. Carrier Corp., Syracuse, N. Y.

Weathermaster—Unit air conditioners Carrier Corp., Syracuse, N. Y.

Weatherstat—Thermostats. Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.

Weatherwood — Insulation. United States Gypsum Co., Chicago, Ill.

Webster-Nesbitt—Unit heaters. Webster & Co., Camden, N. J.

Webster-Nesbitt "Little Giant" — Unit heaters. Nesbitt, Inc., John J., Philadelphia, Pa.

Weco—Gas burners. Webster Engineering Co., Tulsa, Okla.

Wedgbelt—V belts and v-belt drives, pulleys. American Pulley Co., Philadelphia, Pa.

Weir—Furnaces, stokers. Meyer Furnace Co., The, Peoria, Ill.

Weldells — Welding fittings. Taylor Forge & Pipe Works, Chicago, Ill.

Weldfast—Welding rod. Revere Copper and Brass, Incorporated, New York, N. Y.

Weldolets—Fittings. Bonney Forge & Tool Works, Allentown, Pa.

Weldomatic — Arc welders. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

Weldotrol — Spot welders. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

Weld-O-Tron—Arc welders. Allis-Chalmers Mfg. Co., Milwaukee, Wis.

Wesco—Fans. Northwest Stove & Furnace Works, Inc., Portland, Ore.

Wesco Giant — Furnaces. Northwest Stove & Furnace Wks., Inc., Portland, Ore.

Westo — Water treatment. Western Chemical Co., Kansas City, Mo.

Whirlcone — Spray nozzles. Water Cooling Equipment Corp., St. Louis, Mo.

Whirljet—Spray nozzles. Spraying Systems Co., Chicago, Ill.

White Star—Valves. Powell Co., Wm., Cincinnati, O.

Whiting—Stokers. Eddy Stoker Corp., Chicago, Ill.

Whiz — Drills. Paramount Products Co., New York, N. Y.

Wilco—Bi-metals. Wilson Co., H. A., The, Newark, N. J.

Wilco—Pipe cutting machines. Oster Mfg. Co., Cleveland, O.

Williams - Hager — Valves. Williams Gauge Co., Pittsburgh, Pa.

Wilson — Arc welders. Air Reduction Sales Co., New York, N. Y.

Windostat—Condensation control. Friez Instrument Div., Bendix Aviation Corp., Towson, Md.

Wind-O-Vane—Propeller fans. Sturtevant Co., B. F., Boston, Mass.

Wind-O-Vent—Window ventilator and filter units. Reed Unit-Fans, Inc., New Orleans, La.

Wing-Scruplex — Fans, ventilators. Wing Mfg. Co., L. J., New York, N. Y.

Winkler—Stokers. U. S. Machine Corp., Lebanon, Ind.

Winter-Chaser—Air conditioning units, furnaces, heaters. Campbell Heating Co., Des Moines, Ia.

Wire-Kind—Air filters. Dillinger Corp., Rochester, N. Y.

Wissco — Grilles, welding rod. Wickwire Spencer Steel Co., New York, N. Y.

Witch — Hangers, protectors, valves. Carpenter & Paterson, Inc., East Boston, Mass.

Wolverine—Fans, ventilators. Belanger Fan & Blower Co., Detroit, Mich.

X-L — Gaskets, packing. Excelsior Leather Washer Co., Rockford, Ill.

Xacto — Meters. Bowser, Inc., Fort Wayne, Ind.

"X" Boilerliquid—Compounds. X Laboratories, Inc., New York, N. Y.

"X" Flush-Rustoff — Boiler cleaning compounds. X Laboratories, Inc., New York, N. Y.

"X" Pipejoin—Cement and compounds. X Laboratories, Inc., New York, N. Y.

Xit—Ventilators. Iona Ventilator Co., Inc., Philadelphia, Pa.

Yager's—Solder. Benson Co., Inc., Alex R., Hudson, N. Y.

Yankee — Regulators. Ohio Products Co., Cleveland, O.

Yarway — Alarms, clamps, expansion joints, nozzles, strainers, traps, valves. Yarnall-Waring Co., Philadelphia, Pa.

Yello-Jacket—Heating boilers. Burnham Boiler Corp., Irvington, N. Y.

Yorkaire—Unit air coolers. York Corp., York, Pa.

Zephaire — Air conditioning units. American Metal Products Co., Fort Worth, Texas.

Zeph-O-Cone—Air diffusers. Waterloo Register Co., Waterloo, Ia.

Zim—Air filters. Chicago Filter Co., Joliet, Ill.

Zincgrip — Sheets. American Rolling Mill Co., Middletown, O.

Zonolite—Insulation. Munn & Steele, Inc., Newark, N. J.

Zonolite—Insulation. Robinson Insulation Co., Great Falls, Mont.

Zonolite—Insulation. Universal Zonolite Insulation Co., Chicago, Ill.

DIRECTORY SECTION

HEATING, PIPING AND AIR CONDITIONING EQUIPMENT FOR INDUSTRY AND LARGE BUILDINGS

PART 3—MANUFACTURERS' ADDRESSES

A

Acadia Synthetic Products Div., Western Felt Works, 4115 Ogden Ave., Chicago, Ill.
Accurate Mfg. Works, 2336-38 Milwaukee Ave., Chicago, Ill.
Accurate Metal Weather Strip Co., Inc., 216 E. 26th St., New York 10, N. Y.
Acer & Whedon, Inc., Medina, N. Y.
Acheson Mfg. Co., Braddock P. O., Rankin, Pa.
Acker Organization, Inc., W. M., 3167 Fulton Rd., Cleveland, O.
Ackermann Mfg. Co., Wheeling, W. Va.
Acme Asbestos Covering & Flooring Co., 236 N. Elizabeth St., Chicago 7, Ill.
Acme Electric Welder Co., 2618 Fruitland Rd., Los Angeles 11, Calif.
Acme Industries, Inc., Cor. Mechanic and Ganson Sts., Jackson, Mich.
Acme Refining Co., The, W. 56th & W. & L. E. Ry. Cleveland, O.
Acme Steel Co., 2840 Archer Ave., Chicago 8, Ill.
Acme Tin Plate & Roofing Supply Co., 3rd and Westmoreland Sts., Philadelphia, Pa.
Acme White Lead & Color Works, 8250 St. Aubin Ave., Detroit, Mich.
Acorn Refining Co., 8001 Franklin Ave., Cleveland, O.
Activator Process Sales Co., 501 S. Marengo Ave., Alhambra, Calif.
Adam Electric Co., Frank, 3650 Windsor St., St. Louis, Mo.
Adams Co., The, E. 4th St., P. O. Box 268, Dubuque, Ia.
Adams Co., Inc., R. P., 55 Chicago St., Buffalo, N. Y.
Advance Aluminum Castings Corp., 2742 W. 36th Pl., Chicago, Ill.
Advance Electric Co., 1260 W. Second St., Los Angeles, Calif.
Advance Fan & Blower Co., 3428 Bagley, Detroit, Mich.
Advance Insulating Co., Magee Bldg., Pittsburgh, Pa.
Aeolus Dickinson, 3320 S. Artesian Ave., Chicago, Ill.
Aerofin Corp., 410 S. Geddes St., Syracuse, N. Y.
Aeroil Burner Co., Inc., Park Ave. at 57th St., West New York, N. J.
Aerovent Fan Co., 710 E. Ash St., Piqua, O.
Aget-Detroit Co., 602 First National Bank Bldg., Ann Arbor, Mich.
Agnew Electric Co., Milford, Mich.
Ahlberg Bearing Co., 3081 W. 47th St., Chicago, Ill.
Air Conditioning Products Co., 1230-18th St., Detroit, Mich.
Air Control Products, Inc., Coopersville, Mich.
Air Controls, Inc., 2311 Superior Ave., Cleveland 14, O.
● Air Devices, Inc., 17 E. 42nd St., New York, N. Y.
Air Filter Engineering Co., 2446 S. Parkway, Chicago, Ill.
Aire-Foile Fan & Blower Co., 4737 W. Vernor Highway, Detroit, Mich.
● Air Reduction Sales Co., 60 E. 42nd St., New York 17, N. Y.
● Air & Refrigeration Corp., 475 Fifth Ave., New York, N. Y.
Airgard Mfg. Co., 609 N. La Salle St., Chicago, Ill.
Airkem Corp., 52 Vanderbilt Ave., New York, N. Y.
Airmaster Corp., 4317 Ravenswood Ave., Chicago, Ill.
● Air-Maze Corp., 5200 Harvard Ave., Cleveland, O.
Air Supply Co., 2726 N. Ashland Ave., Chicago, Ill.
AirO-Fin Register Co., 19159 John R St., Detroit, Mich.
Air-O-Cel Industries, Inc., 11616 Cloverdale Ave., Detroit, Mich.
Air-O-Line Co., The, 2118 Griffin St., Dallas 2, Tex.
Air-Stream Filter Corp., 2100 Washington Ave., St. Louis 3, Mo.
● Airtemp, Div. of Chrysler Corp., 1119 Leo St., Dayton 1, O.
● Airtherm Mfg. Co., 711 S. Spring Ave., St. Louis 10, Mo.
Airwasher Corp., 1122 N. Washington Ave., Lansing, Mich.
Ajax Flexible Coupling Co., Westfield, N. Y.
Akron Metallic Gasket Co., 155 N. Union, Akron, O.
Akwa Heaters, Inc., 1955 Park Ave., New York 35, N. Y.
Alabama Pipe Co., Anniston, Ala.
Albertson & Co., Inc., Sioux City, Ia.
Albright Equipment Co., 100 Station St., Johnstown, Pa.
● Alco Valve Co., 865 Kingsland Ave., St. Louis 5, Mo.
Aldrich Pump Co., 4 Pine St., Allentown, Pa.
Alexander Bros., 406 N. 3rd, Philadelphia, Pa.
Alfol Insulation Co., Inc., 155 E. 44th St., New York, N. Y.
All Metal Weatherstrip Co., 229 W. Illinois St., Chicago, Ill.
Allegheny Ludlum Steel Corp., Brackenridge Pa.
Allen Billmyre Co., 431 Fayette Ave., Mamaroneck, N. Y.
Allen-Bradley Co., 1335 S. First St., Milwaukee, Wis.
● Allen Corp., 9767 Erwin Ave., Detroit, Mich.
Allied Weld-Craft, Inc., 401 W. South St., Indianapolis 4, Ind.
Allington & Curtis Mfg. Co., 1500 Holland Ave., Saginaw, Mich.
● Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.
● Allis Co., Louis, The, 427 E. Stewart St., Milwaukee, Wis.
Alloy Steel Products Co., 1000 W. Elizabeth Ave., Linden, N. J.
Allpax Co., Inc., Mamaroneck, N. Y.
All-Vac Steam Control System, 205 W. Wacker Dr., Chicago, Ill.; General Sales Office, 3145 N. Mascher St., Philadelphia 33, Pa.
Alpha Metal & Rolling Mills, Inc., 363 Hudson Ave., Brooklyn 1, N. Y.
Alphil Spot Welding Co., 431 W. Broadway, New York, N. Y.
Alrose Chemical Co., Providence, R. I.
Alten's Foundry & Machine Works, 226 W. Wheeling St., Lancaster, O.
Alton Mineral Wool Insulation Co., P. O. Box 268, Alton, Ill.
Aluminum Co. of America, 801 Gulf Bldg., Pittsburgh, Pa.
American Agile Corp., 5806 Hough Ave., Cleveland 3, O.
American Air Conditioning Co., Boulevard Bldg., Detroit, Mich.
● American Air Filter Co., Inc., 107 Central Ave., Louisville 8, Ky.
American Automatic Typewriter Co., 614 N. Carpenter St., Chicago, Ill.
American Blower Corp., Box 58, Roosevelt Park Annex, Detroit, Mich.
● American Brass Co., 414 Meadow St., Waterbury 88, Conn.
American Car & Foundry Co., 36 Church St., New York, N. Y.
American Cast Iron Pipe Co., 2930 N. 16th St., Birmingham 2, Ala.
American Coal Burner Co., 18 E. Erie St., Chicago 11, Ill.
American Coils, Inc., 25-27 Lexington St., Newark, N. J.
American Coolair Corp., 3604 Mayflower St., P. O. Box 2300, Jacksonville 3, Fla.
American Cooling Tower Co., 2710 McGee St., Kansas City, Mo.
● American District Steam Co., 25 Bryant St., North Tonawanda, N. Y.
American District Telegraph Co., 155 Sixth Ave., New York, N. Y.
American Flange & Mfg. Co., Inc., 1901 R. C. A. Bldg., New York 20, N. Y.
American Flexible Coupling Co., 1801 Pittsburgh Ave., Erie, Pa.
American Foundry Equipment Co., 619 S. Byrkit St., Mishawaka, Ind.
American Foundry & Furnace Co., Washington St. at McClun, Bloomington, Ill.
American Furnace Co., 2719-31 Delmar Blvd., St. Louis, Mo.
American Hair & Felt Co., 1828 Merchandise Mart, Chicago 54, Ill.
American Hammered Piston Ring Div., Koppers Co., Bush and Hamburg Sts., Baltimore, Md.
American Hard Rubber Co., 11 Mercer St., New York, N. Y.
American Injector Co., 1481-14th St., Detroit 16, Mich.
American Instrument Co., Silver Spring, Md.
American K. A. T. Corp., 331 Madison Ave., New York 17, N. Y.
American-La France-Foamite Corp., 100 E. La France St., Elmira, N. Y.
American-Larson Ventilating Co., 1004 Keystone Bank Bldg., Pittsburgh, Pa.
American Locomotive Co., Alco Products Div., 30 Church St., New York, N. Y.
American Locomotive Co., Diesel Engine Div., Auburn, N. Y.
American Manganese Bronze Co., Rhawn & Hegerman Sts Philadelphia, Pa.
American-Marsh Pumps, Inc., 60 Capital Ave., N. E. Battle Creek, Mich.
American Metal Hose Branch, American Brass Co., 67 Jewelry St., Waterbury, Conn.
American Metal Products Co., 730 Hudgins St., Box 66 Sylvania Sta., Fort Worth 9, Tex.
American Metal Weather Strip Co., 144 N. Division Ave., Grand Rapids 2, Mich.
American Meter Co., Inc., 60 E. 42nd St., New York 17, N. Y.
American Moistening Co., 260 W. Exchange St., Providence, R. I.
American Molded Products Co., 1644 N. Honore St., Chicago 22, Ill.
American Nickeloid Co., 113 Second St., Peru, Ill.
American Photocopy Equipment Co., 2849 N. Clark St., Chicago 14, Ill.
● American Pipe Bending Machine Co., Inc., 37 Pearl St., Boston 10, Mass.
American Pipe Tool Co., 4856 W. Kinzie St., Chicago, Ill.

● Advertisement in this issue. See Index to Advertisers, page 322.

American Pulley Co., 4200 Wissahickon Ave., Philadelphia, Pa.
American Radiator & Standard Sanitary Corp., Bessemer Bldg., Pittsburgh 22, Pa.
● American Rolling Mill Co., The, 703 Curtis St., Middletown, O.
American Schaefer & Budenberg Instrument Div., Manning, Maxwell & Moore, Inc., 11 Elias St., Bridgeport 2, Conn.
American Sheet Metal Works, 331 N. Alexander, New Orleans, La.
● American Smelting & Refining Co., 120 Broadway, New York, N. Y.
American Solder & Flux Co., 2152 E. Norris St., Philadelphia, Pa.
American Steel Band Co., Box 565, Pittsburgh 30, Pa.
American Steel & Wire Co., Rockefeller Bldg., Cleveland 13, O.
American Sterilizer Co., Erie, Pa.
American Teksag Products Co., Inc., 395 N. MacQuesten Pkwy., Mt. Vernon, N. Y.
American Thermometer Co., 2907 Clark Ave., St. Louis, Mo.
American Warming & Ventilating Co., 1017-1021 Summit St., Toledo 4, O.
American Water Softener Co., Lehigh Ave. and 4th St., Philadelphia 33, Pa.
American Well Wks., 100 N. Broadway, Aurora, Ill.
American Zinc Products Co., Greencastle, Ind.
Ames Co., W. R., 150 Hooper St., San Francisco 7, Calif.
Ames Hydrovac Corp., 290 Scholes St., Brooklyn, N. Y.
Ames Iron Works, Division of Pierce Butler Radiator Corp., Oswego, N. Y.
Amirton Co., Inc., 149 Broadway, New York 6, N. Y.
Anchor Packing Co., 401 N. Broad St., Philadelphia, Pa.
Anchor Stove & Range Co., Third & Culbertson Sts., New Albany, Ind.
Andale Co., 1604 Arch, Philadelphia, Pa.
Andersen Corp., Bayport, Minn.
● Anderson Co., V. D., The, 1949 W. 96th St., Cleveland, O.
Anderson Engine & Foundry Co., Anderson, Ind.
Anderson Products, Inc., 17 Tudor St., Cambridge, Mass.
● Anderson-Stolz Corp., 1731 Walnut St., Kansas City, Mo.
Anemostat Corp. of America, 10 E. 39th St., New York 16, N. Y.
Anetsberger Bros., 3505 Elston Ave., Chicago, Ill.
Ansul Chemical Co., Marinette, Wis.
Apollo Steel Co., 609 Warren Ave., Apollo, Pa.
April Showers Co., 4126 Eighth St., N.W., Washington 11, D. C.
Aqua-Mist Co., 426 Jefferson St., Topeka, Kans.
Aqua-Restor Div., Mayer Mfg. Corp., 50 Division Pl., Brooklyn, N. Y.
Aqua-Sorb Co., 21 S. 16th St., East Orange, N. J.
Aquatic Chemical Laboratories, Inc., 95 Liberty St., New York 6, N. Y.
Arcos Corp., 401 N. Broad St., Philadelphia, Pa.
Arcweld Mfg. Co., Inc., 3469 Third Ave., W., Seattle 99, Wash.
Arex Co., 333 N. Michigan Ave., Chicago, Ill.
Armour Ammonia Works, 1355 W. 31st St., Chicago, Ill.
Armstrong-Blum Mfg. Co., 5700 Bloomingdale Rd., Chicago, Ill.
Armstrong Bros. Tool Co., 317-357 N. Francisco Ave., Chicago, Ill.
Armstrong Co., The, Post Ave. and South St., Detroit, Mich.
Armstrong Cork Co., 4400 Concord St., Lancaster, Pa.
Armstrong Heat Control Co., 1626 N.E. Union Ave., Portland, Ore.
● Armstrong Machine Wks., 874 Maple St., Three Rivers, Mich.
Armstrong Mfg. Co., 303 Knowlton St., Bridgeport, Conn.
Arrow-Hart & Hegeman Elect. Co., 103 Hawthorn St., Hartford, Conn.
Art Valve Co., 4237 N. Lincoln, Chicago, Ill.
Ashcroft Gauge Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn.
Ashton Valve Co., 161-1st St., Cambridge 42, Mass.
Askania Regulator Co., 1603 S. Michigan Ave., Chicago 16, Ill.
Asphalt Products Co., Eastwood Sta., Syracuse, N. Y.
Atkins & Co., E. C., 402 S. Illinois St., Indianapolis 9, Ind.
Atlantic Metal Hose Co., Inc., 123 W. 64th St., New York, N. Y.
Atlantic Steel Boiler Co., 21st St. and Washington Ave., Philadelphia, Pa.
Atlas Chemical Co., Marietta, O.
Atlas Heating & Ventilating Co., Ltd., 557 Fourth St., San Francisco, Calif.
Atlas Valve Co., Inc., 282 South St., Newark, N. J.
Atlas Welding Accessories Co., 14820 Wyoming Ave., Detroit 21, Mich.
Auburn Foundry Inc., Stoker Div., Auburn, Ind.
Auditorium Conditioning Corp., 17 E. 42nd St., New York, N. Y.
● Auer Register Co., 3608 Payne Ave., Cleveland, O.
Aurora Pump Co., 619 Loucks St., Aurora, Ill.
Austin-Mason Co., 15 Park Row, New York, N. Y.
Au-Temp-Co Corp., 521 Fifth Ave., New York 17, N. Y.
Autoforce Ventilating System, 244 Washington St., Boston 8, Mass.
Automatic Control Co., 1005 University Ave., St. Paul 4, Minn.
Automatic Gas Equipment Co., 301 Brushton Ave., Pittsburgh 21, Pa.
● Automatic Products Co., 2450 N. 32nd St., Milwaukee, Wis.
Automatic Pump & Softener Corp., 1907 Kishwaukee St., Rockford, Ill.
Automatic Switch Co., 41 E. 11th St., New York 3, N. Y.
Automatic Temperature Control Co., Inc., 44 E. Logan St., Philadelphia 44, Pa.
Automatic Ventilator Co., 503 S. Shiawasse, Corunna, Mich.
Automotive Maintenance Machinery Co., North Chicago, Ill.
Azor Corp., 107 Montgomery Ave., Irvington, N. J.

B

B/W Controller Corp., 2200 E. Maple Ave., Birmingham, Mich.
Babbitt Industrial Specialties Co., 630 Fifth Ave., New York 20, N. Y.
Babcock & Wilcox Co., 85 Liberty St., New York 6, N. Y.
Babcock & Wilcox Tube Co., The, Beaver Falls, Pa.
Bacharach Industrial Instrument Co., 7000 Bennett St., Pittsburgh, Pa.
Bache & Co., Semon, Greenwich & Morton Sts., New York 14, N. Y.
● Badger & Sons Co., E. B., 75 Pitts St., Boston 14, Mass.
Badger Fire Extinguisher Co., 624 Somerville Ave., Somerville 43, Mass.
Baer Bros., 438 W. 37th St., New York, N. Y.
Bahnson Co., 1001 S. Marshall St., Winston-Salem, N. C.
Bailey Meter Co., 1050 Ivanhoe Rd., Cleveland 10, O.
● Baker Ice Machine Co., Inc., 1509 Evans St., Omaha, Nebr.
Baldor Electric Co., 4353 Duncan Ave., St. Louis, Mo.
Baldwin Belting, Inc., 85 Chambers St., New York, N. Y.
Baldwin De La Vergne Sales Corp., Paschall P. O., Philadelphia, Pa.
Baldwin-Hill Co., 531 Klagg Ave., Trenton 2, N. J.
Ballantyne Co., 222 N. 16th St., Omaha, Nebr.
Balloffet Dies and Nozzle Co., Inc., 6825 Adams St., Guttenberg, N. J.
Bantam Bearings Div., The Torrington Co., South Bend 21, Ind.
Barber Asphalt Corp., Barber, N. J.
● Barber-Colman Co., 225 Loomis St., Rockford, Ill.
Barber Gas Burner Co., 3704 Superior Ave., Cleveland 14, O.
Barclay, Inc., Robert, 128 N. Peoria St., Chicago, Ill.
Barco Mfg. Co., Not Inc., 1801 Winnemac Ave., Chicago 40, Ill.
Bardco Mfg. & Sales Co., 2450 E. 23rd St., Los Angeles, Calif.
Bargar Sheet Metal Co., 12401 Euclid St., Cleveland, O.
Barium Stainless Steel Corp., 1502 Allen Ave., S. E., Canton, O.
Barland Weatherstrip Material Co., 1960 E. 59th St., Cleveland 3, O.
Barlow Engineering Co., 157 E. 128th St., New York, N. Y.
Barnes & Jones, Inc., 128 Brookside Ave., Jamaica Plain, Boston 30, Mass.
Barnes Tool Co., The, 152 Brewery St., New Haven 6, Conn.
Barrett Div., The, Allied Chemical & Dye Corp., 40 Rector St., New York 6, N. Y.
Barrett, Haentjens & Co., Hazleton, Pa.
Barrett Machine Co., 912-916 Behan St., N. S., Pittsburgh 12, Pa.
Bartlett Mfg. Co., 3003 E. Grand Blvd., Detroit, Mich.
Bass Foundry & Machine Co., 1602-1734 Hanna St., Ft. Wayne, Ind.
Bausch & Lomb Optical Co., 635 St. Paul St., Rochester 2, N. Y.
Bayer Co., 4030 Chouteau Ave., St. Louis, Mo.
Bayley Blower Co., 1817 S. 66th St., Milwaukee, Wis.
Beach-Russ Co., 64A Church St., New York, N. Y.
Beacon-Morris Corp., 110-114 Brookline Ave., Boston 15, Mass.
Bear Mfg. Co., Industrial Div., Rock Island, Ill.
Bearings Co. of America, 501 Harrisburg Ave., Lancaster, Pa.
Beaton & Cadwell Mfg. Co., 185 Main St., New Britain, Conn.
Beaton & Corbin Mfg. Co., Southington, Conn.
Beatty Machine & Mfg. Co., 934 150th St., Hammond, Ind.
Beaver Pipe Tools, Inc., 310 Dana Ave., Warren, O.
Beck Engineering Combustion Kompany, 3033 Spruce St., St. Louis, Mo.
Beckel & Co., Inc., Wm., Philadelphia, Pa.
Beckley Perforating Co., 301 North Ave., Garwood, N. J.
Belanger Fan & Blower Co., 1230 18th St., Detroit, Mich.
Belco Exhaust Fan Mfg. Co., 3830-32 Olive St., St. Louis, Mo.
Belfield Co., H., 435 N. Broad St., Philadelphia, Pa.
Belknap Mfg. Co., 800 Union Ave., Bridgeport 1, Conn.
● Bell & Gossett Co., Morton Grove, Ill.
Belmont Packing & Rubber Co., The, Butler & Sepviva Sts., Philadelphia, Pa.
Belmont Smelting & Refining Wks., Inc., 349 Belmont Ave., Brooklyn, N. Y.
Bendix Aviation Corp., Philadelphia Div., Philadelphia, Pa.
Benjamin Air Rifle Co., 1527 S. 8th St., St. Louis 4, Mo.
Benjamin Electric Mfg. Co., Des Plaines, Ill.
Bennett Oil Co., 964 S. Saddle Creek Rd., Omaha 6, Nebr.
Benson Co., Inc., Alex R., 1040 Bay Rd., So. Hudson, N. Y.
Berger Bros. Co., 229-237 Arch St., Philadelphia, Pa.
Berger Mfg. Div., Republic Steel Corp., 1038 Belden Ave., Canton, O.
Bern's Specialty Mfg. Co., 2278 Elston Ave., Chicago, Ill.
Bernz Co., Inc., Otto, 280 Lyell Ave., Rochester 6, N. Y.
Berry, Jr., & Co., Inc., F. E., Everett, Mass.
Bertsch & Co., Inc., Church St., Cambridge City, Ind.
Best Register Co., 2005 W. Oklahoma Ave., Milwaukee 7, Wis.
Bethlehem Foundry & Machine Co., W. Second St., Bethlehem, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Betz Corp., 460 State St., Hammond, Ind.
Betz Engineering Co., 1820 Wyandotte St., Kansas City 8, Mo.
Beverly Throatless Shear Co., 3009 W. 110th Pl., Chicago, Ill.
Bien Air Conditioning Co., Bell, Calif.
Bigelow Co., 92 River St., New Haven 13, Conn.
Biggs Boiler Wks. Co., Case Ave. & B. & O. R. R., E. Akron, O.
Bignall & Keeler Machine Wks., Edwardsville, Ill.
Billings & Spencer Co., 1 Laurel St., Hartford, Conn.
Binks Mfg. Co., 3114-40 Carroll Ave., Chicago 12, Ill.
Bird-Archer Co., 4337 North America St., Philadelphia, Pa.
Bishop & Babcock Mfg. Co., 4901 Hamilton Ave., Cleveland 14, O.

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Black & Decker Mfg. Co., Pennsylvania Ave., Towson, Md.
Black Magic Products Co., P. O. Box 1703, Tulsa, Okla.
Black-Sivalls & Bryson, Inc., 7501 E. 10th St., Kansas City 3, Mo.
Blackhawk Mfg. Co., 5325 W. Rogers St., Milwaukee, Wis.
Blackmer Pump Co., 1920A Century Ave., S. W., Grand Rapids 9, Mich.
Blaisdell Compressor Co., 227 Fulton St., New York, N. Y.
Bliss Co., E. W., 1420 Hastings St., Toledo, O.
Blocksom & Co., E. 5th St., Michigan City, Ind.
Blood Brothers Machine Co., Allegan, Mich.
Blower Application Co., 918 N. Fourth St., Milwaukee, Wis.
Blue Seal Chemical Co., 177 Westfield Ave., W., Roselle Park, N. J.
Bluffton Mfg. Co., The, 433 W. Main Cross St., Findlay, O.
Bodine Electric Co., 2254 W. Ohio St., Chicago 12, Ill.
Boester, Carl F., 101 E. Essex—Kirkwood, St. Louis, Mo.
Bogue Electric Co., 37 Kentucky Ave., Paterson 3, N. J.
Bohn Aluminum & Brass Corp., 2306 Franklin St., Detroit, Mich.
Boiler Room Equipment, Inc., 468 Fourth Ave., New York, N. Y.
● Bonney Forge & Tool Wks., Tilghman St. & Meadow St., Allentown, Pa.
Bordo Co., Inc., L. J., 115 New St., Glenside, Pa.
Borm Mfg. Co., Elgin, Ill.
Boston Auto Gage Co., 70 West St., Pittsfield, Mass.
Boston Gear Works, Inc., North Quincy, Mass.
Boston Woven Hose & Rubber Co., 29 Hampshire St., Cambridge, Mass.
Botfield Refractories Co., Swanson & Clymer Sts., Philadelphia, Pa.
Bowser, Inc., 1302 E. Creighton Ave., Fort Wayne 5, Ind.
Boylston Steam Specialty Co., 116-122 W. Illinois St., Chicago, Ill.
Brabender Corp., Rochelle Park, N. J.
Brasco Mfg. Co., Harvey, Ill.
Brauer Supply Co., A. G., 2100 Washington Ave., St. Louis 3, Mo.
Breidert Co., G. C., 634 S. Spring St., Los Angeles 14, Calif.
Bremil Mfg. Co., Box 1030, Erie, Pa.
Bridgeport Brass Co., 30 Grand St., Bridgeport 2, Conn.
Bridgeport Thermostat Co., Inc., Connecticut Ave., Bridgeport 1, Conn.
Bristol Co., The, P.O. Box 1790, Waterbury 91, Conn.
Brooke Engineering Co., Inc., 4517 Wayne Ave., Philadelphia, Pa.
Brookfield Engineering Laboratories, Sharon, Mass.
● Brooks Equipment Corp., 90 West Ave., New York, N. Y.
Bros Boiler & Mfg. Co., Wm., 1057 Tenth Ave., S. E., Minneapolis, Minn.
Brown-Brockmeyer Co., Inc., 1098 Smithville Rd., Dayton, O.
Brown Fintube Co., The, Elyria, O.
Brown-Ford Corp., Newton, Mass.
Brown Instrument Co., Div. of Minneapolis-Honeywell Regulater Co., 4534 Wayne Ave., Philadelphia, Pa.
Brownell Co., 300 N. Findlay St., Dayton, O.
Browning Mfg. Co., Inc., 1940 Browning Blvd., Maysville, Ky.
Brundage Co., The, 500-514 N. Park St., Kalamazoo 11, Mich.
Bruning Co., Inc., Charles, 42-33 Ninth St., Long Island City, N. Y.
Brunner Mfg. Co., 1821 E. Broad St., Utica 1, N. Y.
Bryan Steam Corp., P. O. Box 337, Peru, Ind.
● Bryant Heater Co., The, 17825 St. Clair Ave., Cleveland, O.
Bubar, Hudson H., 15 Park Row, New York 7, N. Y.
Buckeye Products Co., 7024 Vine St., Cincinnati 16, O.
Buda Co., Harvey, Ill.
● Buffalo Forge Co., 171 Mortimer St., Buffalo, N. Y.
Buffalo Meter Co., 2917 Main St., Buffalo 14, N. Y.
● Buffalo Pumps, Inc., 171 Mortimer St., Buffalo, N. Y.
Buffalo Tank Corp., Dunellen, N. J.; Buffalo, N. Y.
● Builders-Providence, Inc., Div. of Builders Iron Foundry, 9 Codding St., Providence, R. I.
● Bullard Co., The, 286 Canfield Ave., Bridgeport, Conn.
Bundy Steam Trap Co., Nashua, N. H.
Bundy Tubing Co., 10951 Hern Ave., Detroit 13, Mich.
Burhorn Co., Edwin, 554 W. 48th St., New York, N. Y.
Burke Electric Co., 1201 W. 12th St., Erie, Pa.
Burke Stoker & Mfg. Co., 921 W. 19th St., Chicago, Ill.
Burling Instrument Co., Air Conditioning Div., 253 Springfield Ave., Newark 3, N. J.
● Burnham Boiler Corp., Main St., Irvington, N. Y.
Burnham Stoker Co., 505 Columbia St., Vancouver, Wash.
Burnley Battery & Mfg. Co., Clay St., North East, Pa.
Burrows Mfg. Co., F. A., 318 E. Poplar St., York, Pa.
Burt Mfg. Co., 635 Main St., Akron, O.
Bury Compressor Co., 18th & Cascade Sts., Erie, Pa.
● Bush Mfg. Co., 100 Wellington St., Hartford 6, Conn.
● Byers Co., A. M., Clark Bldg., Pittsburgh 22, Pa.
Byron Jackson Co., P. O. Box 2017, Terminal Annex, Los Angeles, Calif.

C

C-B Tool Co., Wabank Rd., Lancaster, Pa.
Cabot, Inc., Samuel, 141 Milk St., Boston 9, Mass.
Calbar Paint & Varnish Co., 2612-26 N. Martha St., Philadelphia 25, Pa.
Caldwell Co., W. E., 2120 Brook St., Louisville, Ky.
Calgon, Inc., Hagan Bldg., Pittsburgh 30, Pa.
Callahan Can Machine Co., Inc., 80 Richard St., Brooklyn, N. Y.
Calorider Corp., 1 Atlantic St., Stamford, Conn.
Caloroil Burner Corp., 1477 Park St., Hartford, Conn.
Campbell Heating Co., E. K., 2445 Charlotte St., Kansas City, Mo.
Campbell Heating Co., 31st & Dean, P. O. Box 833, Des Moines 4, Ia.
Canatsey Electric Mfg. Co., 620 Wyandotte St., Kansas City, Mo.
Cannon Chemical Co., 210 Broadway, Everett, Mass.
Canton Stoker Corp., 407 Andrew Place, S. W., Canton 1, O.
Canvas Products Co., 1236 S. 7th St., St. Louis, Mo.
Capitol Brass Works, Div. of Bohn Aluminum & Brass Corp., 2306 Franklin St., Detroit, Mich.
Carbide and Carbon Chemicals Corp., 30 E. 42nd St., New York 17, N. Y.
● Carey Mfg. Co., Philip, Wayne Ave., Lockland, Cincinnati, O.
Cargocaire Engineering Corp., 75 West St., New York, N. Y.
Carling Turbine Blower Co., 25 St. John's Rd., Worcester, Mass.
● Carnegie-Illinois Steel Corp., Carnegie Bldg., Pittsburgh 19, Pa.
Carnes, Inc., John R., Greenlawn Ave. & Erie R. R., Lima, O.
Carney Rockwool Co., Mankato, Minn.
Carpenter & Paterson, Inc., 1190 Bennington St., East Boston, Mass.
Carpenter Steel Co., The, Welded Alloy Tube Div., Kenilworth, N. J.
Carrier Corp., 302 S. Geddes St., Syracuse, N. Y.
Carter Products Corp., 6921 Carnegie Ave., Cleveland 3, O.
Carty & Moore Engineering Co., 511 W. Larned St., Detroit, Mich.
Case & Son Mfg. Co., W. A., 33 Main St., Buffalo, N. Y.
● Cash Co., A. W., P. O. Box 135, Decatur, Ill.
Cash Valve Mfg. Co., A. W., 666 Wabash Ave., Decatur A, Ill.
Cashin Co., W. D., 69 A St., Boston 27, Mass.
Catawissa Valve & Fittings Co., Catawissa, Pa.
Caterpillar Tractor Co., 600 W. Washington St., Peoria, Ill.
Catskill Metal Works, Inc., Catskill, N. Y.
Celanese Celluloid Corp., 180 Madison Ave., New York, N. Y.
Celotex Corp., The, 120 S. La Salle Bldg., Chicago, Ill.
Cement Lined Pipe Co., 93 Brookline St., Lynn, Mass.
Central Brass Mfg. Co., 2950 E. 55th St., Cleveland, O.
Central Die Casting & Mfg. Co., Inc., 2935 W. 47th St., Chicago, Ill.
Central Foundry Co., 386 Fourth Ave., New York, N. Y.
Central Station Steam Co., 2920 E. Woodbridge St., Detroit 7, Mich.
Central Wire & Iron Works, 621 E. Locust St., Des Moines, Ia.
Centrifix Corp., 3029 Prospect Ave., Cleveland 15, O.
Centri-Spray Co., 14290 Meyers Rd., Detroit 27, Mich.
Century Electric Co., 1806 Pine St., St. Louis, Mo.
Century Engineering Corp., 401-431 3rd St., S. E., Cedar Rapids, Ia.
Century Fan & Ventilator Co., 103 E. 125th St., New York, N. Y.
Certain-teed Products Corp., 100 E. 42nd St., New York, N. Y.
Certified Flexible Couplings, 369 Lexington Ave., New York 17, N. Y.
Certified Gauge & Instrument Corp., Maytag Bldg. at 34th St., Long Island City, N. Y.
Chace Co., W. M., 1606 Beard Ave., Detroit, Mich.
Chain Belt Co., 1617 W. Bruce, Milwaukee, Wis.
Chamberlin Metal Weather Strip Co., 1254 La Brosse St., Detroit, Mich.
Champion Blower & Forge Co., Harrisburg Ave. and Charlotte St., Lancaster, Pa.
Champion Furnace Pipe Co., 215 Eaton St., Peoria 3, Ill.
Champion Machine & Forging Co., 3678 E. 78th St., Cleveland, O.
Champion Unit Heater Co., 4639-41 Washington Blvd., Chicago, Ill.
Chandler Co., 804 First Ave., N. W., Cedar Rapids, Ia.
Chaplin-Fulton Mfg. Co., 28-40 Penn Ave., Pittsburgh, Pa.
Chapman Valve Mfg. Co., The, Indian Orchard, Mass.
Char-Gale Mfg. Co., 3127 Hiawatha Ave., Minneapolis 6, Minn.
Chase Brass & Copper Co., 236 Grand St., Waterbury, Conn.
● Chelsea Fan & Blower Co., Inc., 1206 S. Grove St., Irvington, N. J.
Chelsea Metal Stamping Co., 95 8th Ave., New York, N. Y.
Cheney Metal Products Co., 623 Prospect St., Trenton 5, N. J.
Chesapeake & Ohio R.R. Co., Terminal Tower, Cleveland, O.
Chicago Belting Co., 113-125 N. Green St., Chicago 7, Ill.
Chicago Bridge & Iron Co., 332 S. Michigan Ave., Chicago 4, Ill.
Chicago Die Casting Mfg. Co., 2515 W. Monroe St., Chicago, Ill.
Chicago Expansion Bolt Co., 2240 W. Ogden Ave., Chicago 12, Ill.
Chicago Filter Co., Joliet, Ill.
Chicago Fire Brick Co., 1467 N. Elston Ave., Chicago, Ill.
Chicago Furnace Supply Co., 1278 Clybourn Ave., Chicago, Ill.
Chicago Metal Hose Corp., 1315 S. Third Ave., Maywood, Ill.
Chicago Metal Mfg. Co., 3724 S. Rockwell St., Chicago 32, Ill.
Chicago Nipple Mfg. Co., 1966 Southport Ave., Chicago 14, Ill.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Chicago Pump Co., 2323 Wolfram St., Chicago 18, Ill.
Chicago Specialty Mfg. Co., 2954 Lawrence Ave., Chicago 25, Ill.
Chicago Steel Tank Co., 6400 W. 66th, Chicago, Ill.
Chicago Steel & Wire Co., 103rd St. and Torrence Ave., Chicago, Ill.
Chicago-Wilcox Mfg. Co., E. 77th St. and Anthony Ave., Chicago, Ill.
Chisholm Co., Allen E., 2640 E. Burnside St., Portland, Ore.

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Cincinnati Electrical Tool Co., The, 2684 Madison Rd., Cincinnati 8, O.
Cincinnati Shaper Co., Hopple, Garrard and Elam, Cincinnati, O.
Cincinnati Sheet Metal & Roofing Co., The, 230 E. Front St., Cincinnati, O.
Circulators & Devices Mfg. Corp., 100 Prince St., New York, N. Y.
Cissell Mfg. Co., W. M., 331 S. First St., P. O. Box 1143, Louisville 1, Ky.
● Clarage Fan Co., Porter St., Kalamazoo, Mich.
Clark Bros. Bolt Co., Milldale, Conn.
Clark Controller Co., 1146 E. 152nd St., Cleveland 10, O.
Clark Cooper Co., Palmyra, N. J.
Clark Dust Control Co., 210 N. Mozart St., Chicago, Ill.
Clark Jr. Electric Co., Jas., 600 Bergman St., Louisville, Ky.
Clauss Shear Co., Fremont, O.
Clay Equipment Corp., Cedar Falls, Ia.
Clayton & Lambert Mfg. Co., 14247 Tireman Ave., Dearborn, Mich.
Clayton Mfg. Co., Alhambra, Calif.
Cleaver-Brooks Co., 5100 N. 33rd St., Milwaukee, Wis.
Cleghorn Co., 86 Broad St., Boston, Mass.
Cleveland Punch & Shear Works Co., E. 40th and St. Clair Ave., Cleveland, O.
Clifford Mfg. Co., 564 E. First St., Boston, Mass.
Clinton Metallic Paint Co., P. O. Box 278, Clinton, N. Y.
Clizbe Bros. Mfg. Co., Plymouth, Ind.
Clow & Sons, James B., 201-299 N. Talman Ave., Chicago, Ill.
Cochrane Corp., 3131 N. 17th St., Philadelphia 32, Pa.
Coe Mfg. Co., Bank St., Painesville, O.
Cohoes Rolling Mill Co., Canvass and Cortland Sts., Cohoes, N. Y.
Cole-Sullivan Engineering Co., 1316 Third St., N., Minneapolis, Minn.
Colebrook & Sons, Inc., W. H., 246 Walton St., Syracuse, N. Y.
Colonial Alloys Co., Metals Div., E. Somerset, Trenton Ave. and Reading R. R., Philadelphia, Pa.
Columbia Radiator Co., 3400 Walnut St., McKeesport, Pa.
● Columbia Steel Co. (Sub. United States Steel Corp.), Russ Bldg., 235 Montgomery St., San Francisco 6, Calif.
Columbian Steel Tank Co., 1509 W. 12th St., Kansas City, Mo.
Columbus Heating & Ventilating Co., 182 N. Yale Ave., Columbus, O.
Columbus Steam Pump Wks. Co., 724 W. Gay St., Columbus 8, O.
Combination Boiler Co., Benton Harbor, Mich.
Combustion Control Corp., 77 Broadway, Cambridge 42, Mass.
Combustion Engineering Co., Inc., 200 Madison Ave., New York, N. Y.
Comfort Products Corp., 7 W. 147th St., Harvey, Ill.
Commercial Plastics Co., 201 N. Wells St., Chicago, Ill.
Commercial Shearing & Stamping Co., 1775 Logan, Youngstown, O.
Commonwealth Brass Corp., 5781-5835 Commonwealth Ave., Detroit 8, Mich.
Commonwealth Electric Welder Mfg. Co., 3200-F W. Oxford St. Philadelphia, Pa.
Conco Corp., Div. of H. D. Conkey & Co., Mendota, Ill.
Conditionaire Unit Co., 2821 Montrose Ave., Chicago, Ill.
Congress Die Casting Div., Congress Tool & Die Co., 3750 E. Outer Drive, Detroit, Mich.
Conklin Brass & Copper Co., Inc., T. E., 54-60 Lafayette St., New York, N. Y.
Conneaut Packing Co., Conneaut, O.
Connery Construction Co., 2nd and Luzerne Sts., Philadelphia, Pa.
Connor Engineering Corp., W. B., 114 E. 32nd St., New York, N. Y.
Consolidated Car-Heating Co., Inc., Albany, N. Y.
Consolidated Safety Valve Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn.
Continental Diamond Fibre Co., Newark, Del.
Continental Electric Co., Inc., 323 Ferry St., Newark, N. J.
Continental Motors Corp., Muskegon, Mich.
Continental Products Co., 1150 E. 222nd St., Euclid, O.
Continental Rubber Wks., 1902 Liberty Blvd., Erie, Pa.
Continental Steel Corp., 1108 S. Main St., Kokomo, Ind.
Continental Stove Corp., Front and Walnut Sts., Ironton, O.
Cook, Inc., A. D., Lawrenceburg, Ind.
Cook Electric Co., 2700 Southport Ave., Chicago, Ill.
Cooper Alloy Foundry Co., Hillside, N. J.
Cooper-Bessemer Corp., The, 200 Thomas Ave., Mt. Vernon, O.
Cooper & Cooper, 37 Fenn St., Pittsfield, Mass.
Cooper Co., Clark, Palmyra, N. J.
Cooper Sanitary Co., 3601 Ludlow St., Philadelphia, Pa.
Copeland Refrigeration Corp., Sidney O.
Coppus Engineering Corp., 374 Park Ave., Worcester 2, Mass.
Corbman Bros., Inc., 315 N. 7th St., Philadelphia 6, Pa.
Cork Import Corp., 330 W. 42nd St., New York, N. Y.
Cork Insulation Co., Inc., 155 E. 44th St., New York, N. Y.
Corley Co., 629 Grove St., Jersey City, N. J.
Corning Glass Works, Corning, N. Y.
Coroaire Heater Corp., The, 1124 Hanna Bldg., Cleveland, O.
Cramer Co., Inc., R. W., The, Centerbrook, Conn.
● Crane Co., 836 S. Michigan Ave., Chicago, Ill.
Crane Packing Co., 1801 Belle Plaine Ave., Chicago, Ill.
Crawford Co., 3220 W. 31st St., Chicago, Ill.
Crescent Tool Co., 230 Harrison St., Jamestown, N. Y.
Crise Elec. Mfg. Co., 2040 E. Main, Columbus, O.
● Crocker-Wheeler Electric Mfg. Co. Div., Joshua Hendy Iron Works, Ampere 1, N. J.
Croll-Reynolds Engineering Co., Inc., 17 Johns St., New York 7, N. Y.
Croll & Son, Jesse G., 2326-2606 Germantown Ave., Philadelphia, Pa.
Crown Die & Tool Co., 108 N. Jefferson St., Chicago 6, Ill.
Crown Iron Works, 1229 N. E. Tyler, Minneapolis, Minn.
Crucible Steel Co. of America, 405 Lexington Ave., New York, N. Y.
Cryer Trap & Valve Co., Inc., 366 Madison Ave., New York 17, N. Y.
Cugley Incubator Co., Elkhart, Ind.
Cuno Engineering Corp., 80 S. Vine St., Meriden, Conn.
Curtis & Curtis Co., The, 450 Garden St., Bridgeport, Conn.
● Curtis Refrigerating Machine Co., 1950 Kienlen Ave., St. Louis, Mo.
Cutler-Hammer, Inc., 728 N. 7th St., Milwaukee, Wis.
Cyrus Shank Co., 625 W. Jackson Blvd., Chicago, Ill.

D

Dahlquist Mfg. Co., Inc., 628 Somerville Ave., Somerville 43, Mass.
Daigger & Co., A., 161 W. Kinzie St., Chicago, Ill.
Dallas Engineering Co., Inc., 200 S. Akard, Dallas, Tex.
Dampney Co. of America, 1243 River St., Hyde Park, Boston 36, Mass.
Darcoid Co., Inc., 145 Sixth Ave., New York 13, N. Y.
Darling Valve & Mfg. Co., 701 First St., Williamsport, Pa.
Dart Mfg. Co., E. M., 134 Thurbers Ave., Providence 5, R. I.
Davey Compressor Co., Kent, O.
Davidson Co., M. T., 43-53 Keap St., Brooklyn 11, N. Y.
Davidson Hy Duty Roof Fan Co., 213 California St., Newton, Mass.
Davies Air Filter Corp., 118-120 E. 25th St., New York, N. Y.
Davis & Co., Inc., Dean W., 549 W. Fulton St., Chicago 6, Ill.
Davis Engineering Corp., 1064 E. Grand St., Elizabeth 4, N. J.
Davis Regulator Co., 2546 S. Washtenaw Ave., Chicago 8, Ill.
Davison Chemical Corp., The, 20 Hopkins Place, Baltimore, Md.
Day Co., The, 810-830 Third Ave., N. E., Minneapolis 13, Minn.
Dayton Air Compressor Co., Dayton, O.
Dayton-Dowd Co., 115-17 York St., Quincy, Ill.
Dayton Rubber Mfg. Co., 2345 W. Riverview Ave., Dayton 1, O.
● Dean Brothers Pumps, Inc., 323 W. 10th St., Indianapolis, Ind.
Dean Hill Pump Co., 4000 E. 16th St., Indianapolis, Ind.
Dearborn Chemical Co., 310 S. Michigan Ave., Chicago, Ill.
Debevoise Co., The, 968 Grand St., Brooklyn 6, N. Y.
● De Bothezat Ventilating Equipment Div., American Machine & Metals, Inc., East Moline, Ill.
Decatur Iron & Steel Co., P. O. Box 72, Decatur, Ala.
Decatur Pump Co., 2750 Nelson Park Rd., Decatur, Ill.
Defender Automatic Regulator Co., 308 S. 8th St., St. Louis 2, Mo.
De Laval Steam Turbine Co., 300 Nottingham Way, Trenton, N. J.
Delco Appliance Div., General Motors Corp., P. O. Box 230, Rochester 1, N. Y.
Delco Products Div., General Motors Corp., 329 E. First St., Dayton, O.
Delta-Star Electric Co., 2400 Block, W. Fulton St., Chicago, Ill.
Deming Co., 14 Aetna St., Salem, O.
Demuth & Sons, Charles, 245 Elm Place, Mineola, L. I., N. Y.
Dersch, Gesswein & Neuert, Inc., 4849 W. Grand Ave., Chicago, Ill.
Desmond-Stephan Mfg. Co., Urbana, O.
Desolvo Co., The, 31 Terminal Way, Pittsburgh 19, Pa.
Despatch Oven Co., 722 Central Ave., Minneapolis 14, Minn.
Detroit Air Meter Co., Box 1473, Detroit, Mich.
Detroit Brass & Malleable Works, 100 S. Campbell, Detroit 9, Mich.
Detroit Graphite Co., 550 12th St., Detroit, Mich.
● Detroit Lubricator Co., 5900 Trumbull Ave., Detroit 8, Mich.
Detroit Seamless Steel Tubes Co., c/o Grand River Station, Detroit, Mich.
● Detroit Stamping Co., 350 Midland Ave., Detroit, Mich.
Detroit Steel Products Co., 2250 E. Grand Blvd., Detroit, Mich.
Detroit Stoker Co., Fifth Floor, General Motors Bldg., Detroit, Mich.
DeVilbiss Co., The, 300 Phillips Ave., Toledo 1, O.
DeVine Mfg. Co., Inc., J. P., 909 Shawnee Ave., Mt. Vernon, Ill.
Dial Light Co. of America, Inc., 92 West St., New York, N. Y.
Diamond Chain & Mfg. Co., 400 Kentucky Ave., Indianapolis 7, Ind.
Diamond Chemical Products, 17 E. 48th St., New York, N. Y.
Diamond Expansion Bolt Co., Inc., 500 North Ave., Garwood, N. J.
Diamond Mfg. Co., 253 W. Eighth St., Wyoming, Pa.
Diamond Power Specialty Corp., 10340 Oakland, Detroit, Mich.
Diceler Corp., The, Gasport, N. Y.
Dick Co., Inc., R. & J., 24-48 Sade St., Passaic, N. J.
Diehl Mfg. Co., Finderne Plant, 1106 Finderne Ave., Somerville, N. J.
Dillon Co., 220-C E. Brady St., Tulsa, Okla.
Dillon Steam Boiler Wks., Inc., D. M., Crocker St., Fitchburg, Mass.
Dixon Crucible Co., Joseph, Wayne & Monmouth Sts., Jersey City, N. J.
Dockson Corp., 3847 Wabash Ave., Detroit, Mich.
Dockstader, S. E., 1128 Munsey Bldg., Washington, D. C.
Dodge Mfg. Corp., 500 S. Union St., Mishawaka, Ind.
Doheny Co., John J., 326 Lake St., Belmont, Mass.

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Dole Valve Co., The, 1901-41 Carroll Ave., Chicago 12, Ill.
● Dollinger Corp., 11 Centre Park, Rochester 4, N. Y.
Domestic Engine & Pump Co., Shippensburg, Pa.
● Dow Chemical Co., Midland, Mich.
Downingtown Iron Wks., Wallace Ave., Downingtown, Pa.
Downs-Smith Brass & Copper Co., 304-320 E. 45th St., New York, N. Y.
Dracco Corp., 4057 E. 116th St., Cleveland, O.
Dragert Co., Inc., C. H., 237 India St., Brooklyn, N. Y.
● Dravo Corp., Neville Island, Pittsburgh, Pa.
Drayer & Hanson, Inc., 738 E. Pico Blvd., Los Angeles 21, Calif.
Dreis & Krump Mfg. Co., 7404 Loomis Blvd., Chicago, Ill.
Dresser Mfg. Co., 490 Fisher Ave., Bradford, Pa.
Dry-Zero Corp., Merchandise Mart, Chicago 54, Ill.
Dual Air Fan Co., 711 W. Lake St., Chicago, Ill.
● Dunham Co., C. A., 450 E. Ohio St., Chicago 11, Ill.
Dunn, Inc., Struthers, 1321 Arch St., Philadelphia 7, Pa.
du Pont de Nemours & Co., E. I., Electrochemicals Dept., Wilmington, Del.
du Pont de Nemours & Co., Inc., E. I., Fabrics & Finishes Dept., Wilmington, Del.
du Pont de Nemours & Co., E. I., National Ammonia Div., Wilmington, Del.
Durabla Mfg. Co., 114 Liberty St., New York 6, N. Y.
Durakool, Inc., 1010 N. Main St., Elkhart, Ind.
Duraloy Co., Scottdale, Pa.
Duriron Co., Inc., 450 N. Findlay St., Dayton, O.
Duro Co., 537 Monument Ave., Dayton, O.
Dustlix Corp., 715 N. Van Buren St., Milwaukee, Wis.
Dwyer Mfg. Co., F. W., 565 W. Washington Blvd., Chicago 6, Ill.
Dyer Welder & Engineering Co., 7 E. 19th St., Kansas City 8, Mo.
Dynamic Air Engineering, Inc., 843 San Julian St., Los Angeles 14, Calif.

E

● Eagan Co., Walter H., 2336-38 Fairmount Ave., Philadelphia, Pa.
Eagle-Picher Lead Co., American Bldg., Cincinnati 1, O.
Eastern Air Devices, Inc., 585 Dean St., Brooklyn 17, N. Y.
Eastern Engineering Co., 45 Fox St., New Haven, Conn.
Eastern Foundry Co., Boyertown, Pa.
Eastern Foundry Co., Peerless Heater Div., Boyertown, Pa.
Eastern Oil Equipment Co., 133 Marginal Way, Portland 3, Me.
Eastman Kodak Co Kodak Park, Rochester 4, N. Y.
Eclipse Fuel Engineering Co., 707 S. Main St., Rockford, Ill.
Econocol Stoker Div. of Cotta Transmission Corp., 2340 11th St., Rockford, Ill.
Economy Electric Mfg. Co., 4632 W. 21st Pl., Chicago 50, Ill.
Economy Equipment Co., 223 N. Wolcott Ave., Chicago, Ill.
Economy Pumps, Inc., 1000 Weller Ave., Hamilton, O.
Economy Valve Seat Co., 2617-25 Fletcher St., Chicago 18, Ill.
Eddy Stoker Corp., 4717 W. North Ave., Chicago 39, Ill.
Eddy Valve Co., Waterford, N. Y.
Edge Moor Iron Wks., Inc., 30 Rockefeller Plaza, New York, N. Y.
Edison General Electric Appliance Co., Inc., 5600 W. Taylor St., Chicago 44, Ill.
● Edison, Inc., Thomas A., Instrument Div., Lakeside Ave., West Orange, N. J.
Edward Valve & Mfg. Co., Inc., 1200 W. 145th St., East Chicago, Ind.
Edwards Mfg. Co., Inc., 337 Eggleston Ave., Cincinnati, O.
Ehret Magnesia Co., Valley Forge, Pa.
Eiker Mfg. Co., Ogallala, Nebr.
Eimer & Amend, 635 Greenwich St., New York, N. Y.
Eisler Engineering Corp., 754 S. 13th St., Newark, N. J.
Elastic Stop Nut Corp., 2330 Vauxhall Rd., Union, N. J.
Electric Air Heater Co., Division of American Foundry Equipment Co., 619 S. Byrkit St., Mishawaka, Ind.
● Electric Arc, Inc., 152 Jelliff Ave., Newark, N. J.
Electric Auto-Lite Co., Moto Meter Gauge & Equipment Div., Caledonia & Gillette Sts., La Crosse, Wis.
Electric Controller & Mfg. Co., 2700 E. 79th St., Cleveland, O.
Electric Machinery Mfg. Co., 1331 Tyler St., N. E., Minneapolis 13, Minn.
Electric Valve Mfg. Co., Inc., 68 Murray St., New York, N. Y.
Electrimatic Div., The Simoniz Co., 2100 Indiana Ave., Chicago 16, Ill.
Electroaire Corp., 1455 W. Congress St., Chicago, Ill.
Electrogas Furnace Co., 255 Ninth St., San Francisco, Calif.
Electrol Mfg. Co., 253 Chestnut St., Passaic, N. J.
Electrovent Fan & Mfg. Co., 812 W. Lake St., Chicago, Ill.
Elgin Softener Corp., Elgin, Ill.
Elgo Shutter & Mfg. Co., 6970 W. Jefferson Ave., Detroit 17, Mich.
Elliott Co., Jeannette, Pa.
Ellis Drier Co., 2444 N. Crawford Ave., Chicago 39, Ill.
Ellison Draft Gage Co., 214 W. Kinzie St., Chicago 10, Ill.
● Ellsworth Pipe & Supply Co., 1739 W. St. Paul Ave., Milwaukee 3, Wis.
Elsey Metal Specialties Co., 1535 Spruce St., Detroit, Mich.
Emerson Electric Mfg. Co., The, 1847 Washington Ave., St. Louis, Mo.
Empire Sheet & Tin Plate Co., N. Bowman St., Mansfield, O.
Empire Ventilation Equipment Co., 35-39 Vernon Blvd., Long Island City, N. Y.
Endura Mfg Corp., 45 N. 4th St., Quakerstown, Pa.
Engelhard, Inc., Charles, 90 Chestnut St., Newark, N. J.
Engineer Co., 75 West St., New York 6, N. Y.
Enterprise Engine & Foundry Co., 2949 18th St., San Francisco, Calif.
Erdle Perforating Co., 171 York St., Rochester 11, N. Y.
Ergolyte Mfg. Co., 3627 Lawrence St., Philadelphia 40, Pa.
Erie Bolt & Nut Co., Erie, Pa.
Erie City Iron Wks., 1450 East Ave., Erie, Pa.
Erie Tool Wks., 11th & French Sts., Erie 2, Pa.
Essick Mfg. Co., 1950 Santa Fe Ave., Los Angeles, Calif.
Eutectic Welding Alloys Co., 40 Worth St., New York 13, N. Y.
Everhot Products Co., 2059 W. Carroll, Chicago 12, Ill.
Everite Pump & Mfg. Co., Inc., Lancaster, Pa.
Everlasting Valve Co., 49 Fisk St., Jersey City, N. J.
Excelsior Leather Washer Mfg. Co., 720-730 Chestnut St., Rockford, Ill.
Excelsior Steel Furnace Co., 118 So. Clinton St., Chicago, Ill.
Excelsior Tool & Machine Co., 31st & Ridge Ave., East St. Louis, Ill.
Extruded Plastics, Inc., New Canaan Ave., Norwalk, Conn.

F

Fafnir Bearing Co., 37 Booth St., New Britain, Conn.
Fairbanks Co., 393 Lafayette St., New York, N. Y.
Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago, Ill.
Fairmont Aluminum Co., Fairmont, W. Va.
Falstrom Co., Main Ave. & D. L. & W. R. R., Passaic, N. J
Farley Sleeve & Hanger Co., 3748 E. 71st St., Cleveland, O.
Farquhar Co., Ltd., A. B., Duke St., York, Pa.
Farr Co., 2615 Southwest Dr., Los Angeles 43, Calif.
Farrar & Trefts, 20 Milburn St., Buffalo 12, N. Y.
● Fedders Mfg. Co., Inc., 81 Tonawanda St., Buffalo 7, N. Y.
Federal Machine & Welder Co., 212 Dana St., Warren, O.
Federal-Mogul Corp., 11031 Shoemaker St., Detroit, Mich.
Fee & Mason Mfg. Co., Inc., 81 Beekman St., New York, N. Y
Fee and Stemwedel, Inc., 2210 Wabansia Ave., Chicago, Ill.
Felt Products Mfg. Co., 1514 Carroll Ave., Chicago, Ill.
Felters Co., Inc., 210 South St., Boston, Mass.
Ferguson & Lange Foundry Co., 1039 Willow St., Chicago, Ill
Fern, Ralph, 2517 Boulevard Ave., Scranton 9, Pa.
Ferro-Enamel Corp., Liquid Plastics Div., 4150 E. 56th St. Cleveland 5, O.
Ferro-Nil Corp., 381 Fourth Ave., New York 16, N. Y.
Fibre Conduit Co., Orangeburg, N. Y.
Field Control Div., H. D. Conkey & Co., Mendota, Ill.
Filters, Inc., 1515 Gardena St., P. O. Box 471, Glendale, Calif.
● Filtrine Mfg. Co., Inc., 53 Lexington Ave., Brooklyn 5, N. Y.
Fingles, Inc., W. A., Reistertown Rd. at Elgin Ave., Baltimore, Md.
Fireline Stove & Furnace Lining Co., 1800 Kingsbury St., Chicago 14, Ill.
Firemood Machine Wks., Converse, Ind.
Firestone Tire & Rubber Co., S. Main St., Akron, O.
Fir-Tex Insulating Board Co., St. Helens, Ore.
Fischer & Porter Co., 973 County Line Rd., Hatboro, Pa.
Fish-Schurman Corp., 230 E. 4[illegible]th St., New York 17, N. Y.
● Fisher Governor Co., 205 S. First Ave., Marshalltown, Ia.
● Fitzgibbons Boiler Co., Inc., 101 Park Ave., New York 17, N. Y.
Flagg & Co., Inc., Stanley G., 1421 Chestnut St., Philadelphia 2, Pa.
Flemm Lead Co., Inc., Bradley Ave. & School St., Long Island City 1, N. Y.
Flexitallic Gasket Co., 8th & Bailey Sts., Camden, N. J.
Flexlock Corp., 411 E. Market St., Akron, O.
Flexo Supply Co., Inc., 4221 Olive St., St. Louis 8, Mo.
Flintkote Co., The, 30 Rockefeller Plaza, New York 20, N. Y.
● Flori Pipe Co., The, 601 E. Red Bud Ave., St. Louis, Mo.
Floridin Co., Warren, Pa.
Fluor Corp., Ltd., The, 2500 S. Atlantic Blvd., Los Angeles 22, Calif.
Flynn & Emrich Co., 301 Holliday St., Baltimore, Md.
Follansbee Steel Corp., Pittsburgh, Pa.
Ford Roofing Products Co., 111 W. Washington St., Chicago, Ill.
Forman Air Conditioning & Engrg. Co., 345 W. 40th St., New York, N. Y.
Forslund Pump & Machinery Co., 1717-19 Main St., Kansas City, Mo.
Fossum, M. H., 2086 Marshall Ave., St. Paul, Minn.
Foster Engineering Co., 109 Monroe St., Newark, N. J.
Foster Pump Wks., Inc., 46-A Washington St., Brooklyn, N. Y
Foster Wheeler Corp., 165 Broadway, New York, N. Y.
Fowler & Wolfe Radiator Co., Oak and Carson Sts., Norristown, Pa.
Fox Control & Mfg. Co., 3589 E. 93rd St., Cleveland, O.
Foxboro Co., 106 Neponset Ave., Foxboro, Mass.
France Packing Co., 6512 Tacony St., Tacony, Philadelphia 35, Pa.
Frank Heaters, Inc., 150 Railroad Ave., Paterson, N. J.
Frederick Iron & Steel Co., E. 7th St., Frederick, Md.
Fresh-'nd Air Co., 4940 Sheridan Rd., Chicago 40, Ill.
Fretz-Moon Tube Co., Inc., Butler, Pa.
Frick Co., Waynesboro, Pa.
Friez Instrument Div., Bendix Aviation Corp., Towson 4, Md
Frigidaire Div., General Motors Corp., Dayton, O.
Frost Mfg. Co., S. Henderson St., Galesburg, Ill.
Fuel Savers, Inc., 15th and Herr Sts., Harrisburg, Pa.
Fulflo Specialties Co., Inc., The, Blanchester, O.
Fuller Co., 124 Bridge St., Catasauqua, Pa.
● Fulton Sylphon Co., The, Box 400, Knoxville, Tenn.
Furblo Co., Hermansville, Mich.

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G

G. D. S. Machinery & Supply Co., Inc., 101 Walker St., New York, N. Y.
G. M. Mfg. Co., 50 W. 3rd St., New York 12, N. Y.
● G & O Mfg. Co., 138 Winchester Ave., New Haven, Conn.
Gale Products, Galesburg, Ill.
Gallaher Boiler Co., 3615 LaClede Ave., St. Louis, Mo.
Gallaher Co., The, Owatonna, Minn.
Garden City Fan Co., 332 S. Michigan Ave., Chicago 4, Ill.
Gardiner Metal Co., 2514 W. 48th Pl., Chicago, Ill.
Gardner-Denver Co., Quincy, Ill.
Garlock Packing Co., 50 Main St., Palmyra, N. Y.
Gates Rubber Co., The, 999 S. Broadway, Denver 17, Colo.
Gatke Corp., 228 N. La Salle St., Chicago, Ill.
● Gehl Bros. Mfg. Co., West Bend, Wis.
Gehri Co., 1117 Tacoma Ave., Tacoma, Wash.
General Air Conditioning Corp., 4411 Appleton St., Cincinnati, O.
General Blower Co., Inc., 5335 Market St., Philadelphia 39, Pa.
General Blower Corp., 1450 Army St., San Francisco, Calif.
General Ceramics Co., Keasbey, N. J.
● General Controls Co., 801 Allen Ave., Glendale, Calif.
General Electric Co., Air Conditioning and Commercial Refrigeration Divisions, 5 Lawrence St., Bloomfield, N. J.
General Electric Co., Lamp Dept., Nela Park, Cleveland, O.
General Electric Co., Plastics Div., 1 Plastics Ave., Pittsfield, Mass.
General Electric Co., 1 River Rd., Schenectady, N. Y.
General Equipment Co., 315 S. Wichita, Wichita, Kans.
General Fittings Co., 123 Georgia Ave., Providence 5, R. I.
General Furnaces Corp., 90 Broad St., New York 4, N. Y.
General Gas Light Co., 212 N. Park, Kalamazoo 11F, Mich.
General Insulating Products Co., 8821 15th Ave., Brooklyn, N. Y.
General Machinery Co., 3500 Riverside Ave., Spokane, Wash.
General Motors Corp., Detroit, Mich.
● General Motors Corp., Moraine Products Div., Dayton, O.
General Plate Div., Metals & Controls Corp., 34 Forest St., Attleboro, Mass.
General Refrigeration Div., Yates-American Machine Co., Beloit, Wis.
General Sales & Products Co., 242 Saratoga St., Cohoes, N. Y.
Genspring, Inc., 500 Fifth Ave., New York, N. Y.
Gerett Corp., M. A., 724 W. Winnebago St., Milwaukee 5, Wis.
Gerstein & Cooper Co., 1 W. Third St., South Boston, Mass.
Geuder, Paeschke & Frey Co., W. St. Paul Ave. and N. 15th St., Milwaukee, Wis.
Giant Grip Mfg. Co., 30 Osceola St., Oshkosh, Wis.
Giant Mfg. Co., South Ave., Council Bluffs, Ia.
Gilbert & Barker Mfg. Co., West Springfield, Mass.
Gillian Mfg. Co., 7752 Dubois St., Detroit, Mich.
Gilmer Company, L. H., 7230 Keystone St., Tacony, Philadelphia, Pa.
Gisholt Machine Co., 1253 E. Washington Ave., Madison 3, Wis.
Glaser Lead Co., Inc., 31 Wyckoff Ave., Brooklyn, N. Y.
Gleason-Avery, Inc., 27 Clark St., Auburn, N. Y.
Glidden Co., 11001 Madison Ave., Cleveland, O.
Globe Machine & Stamping Co., 1220 W. 76th St., Cleveland, O.
Globe Steel Tubes Co., 3839 W. Burnham St., Milwaukee, Wis.
Glore Sales Corp., Evins F., 1939 Grand Central Terminal Bldg., New York, N. Y.
Goese Mfg. Co., 2548 N. 18th St., Milwaukee 6, Wis
Goethel Sheet Metal Wks., Alfred, 1910 N. Killian Pl., Milwaukee, Wis.
Goetze Gasket & Packing Co., Inc., 60 Allen Ave., New Brunswick, N. J.
Golden-Anderson Valve Specialty Co., Fulton Bldg., Pittsburgh, Pa.
Goldens' Foundry & Machine Co., Columbus, Ga.
Goodrich Co., B. F., 548 S. Main St., Akron, O.
Goodyear Tire & Rubber Co., E. Market St., Akron, O.
Gorton Heating Corp., Cranford, N. J.
Goulds Pumps, Inc., Fall St., Seneca Falls, N. Y.
Governair Corp., 617-31 N. W. 2nd St., P. O. Box 1654, Oklahoma City, Okla.
Grabler Mfg. Co., 6565 Broadway, Cleveland, O.
Graham Transmissions, Inc., 2706 N. Teutonia Ave., Milwaukee, Wis.
Grand Rapids Blow Pipe & Dust Arrester Co., 526-528 Monroe Ave., Grand Rapids 2, Mich.
● Grand Rapids Die & Tool Co., 325 Scribner Ave., N. W., Grand Rapids 4, Mich.
Granite City Steel Co., 20th & Madison Ave., Granite City, Ill.
● Grant Wilson, Inc., 4115 W. Taylor St., Chicago 24, Ill.
Graton & Knight Co., 356 Franklin St., Worcester, Mass.
Graver Tank & Mfg. Co., Inc., 4809 Todd Ave., East Chicago, Ind.
Gray Metal Products, Inc., 30 Carleton St., Rochester, N. Y.
Great Lakes Steel Corp., Ecorse, Detroit, Mich.
Great National Air Conditioning Corp., 2125 N. Harwood, Dallas 1, Tex.
Green Fire Brick Co., A. P., Mexico, Mo.
Green Fuel Economizer Co., 700 Main St., Beacon, N. Y.
Greene, Tweed & Co., 4377 Bronx Blvd., New York, N. Y.
Greenfield Tap & Die Corp., Sanderson St., Greenfield, Mass.
Greenlee Tool Co., 2136 12th St., Rockford, Ill.
Greiner Co., Emil, 161 Sixth Ave., New York, N. Y.
Grief, Edward C., 64 West End Ave., Bogota, N. J.
Griffith Equipment Co., Inc., Los Angeles, Calif.
● Grinnell Co., Inc., 260 W. Exchange, Providence 1, R. I.
Grinnell Co., Inc., Superseal Div., 260 W. Exchange St., Providence, R. I.
Griscom-Russell Co., The, 285 Madison Ave., New York, N. Y.
Grobet File Corp. of America, 3 Park Pl., New York, N. Y.
Grove Regulator Co., 1190 67th St., Oakland, Calif.
Guardian Electric Mfg. Co., 1400 Washington Blvd., Chicago 7, Ill.
Guardian Utilities Co., 215 E. Michigan St., Michigan City, Ind.
Guild & Garrison, Inc., 43 Keap St., Brooklyn 11, N. Y.
Gustin Bacon Mfg. Co., 1412 W. 12th St., Kansas City, 7, Mo.
Guth Co., Edwin F., 2615 Washington Blvd., St. Louis 3, Mo.
Gylstrom Co., O., 108 W. Wells St., Milwaukee, Wis.

H

H-B Instrument Co., 2518 N. Broad St., Philadelphia, Pa.
H. & B. Sales Co., Ltd., 2875 Cherry Ave., Long Beach, Calif.
Haering Co., Inc., D. W., 205 W. Wacker Dr., Chicago 6, Ill.
Hagan Corp., 600 Bowman Bldg., Pittsburgh 30, Pa.
Hague & Co., Inc., Alfred, 227 Thirty-fourth St., Brooklyn, N. Y.
● Haines & Co., William S., 12th & Buttonwood Sts., Philadelphia 23, Pa.
Halowax Products Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.
Hamburg Boiler Wks., Inc., Grand St., Hamburg, Pa.
Hamilton Rubber Mfg. Co., Mead St., Trenton, N. J.
Hammett Electric Mfg. Co., 2558 McGee Traficway, Kansas City 8, Mo.
Hammond Brass Wks., Summer Blvd., Hammond, Ind.
Hampton-Cross Co., The, 1014 W. Main St., Louisville, Ky.
Hampton Electric Mfg. Co., Third and Archie Sts., Oakmont, Pittsburgh, Pa.
Hancock Valve Div., Manning, Maxwell & Moore Inc., 11 Elias St., Bridgeport, Conn.
Handley Brown Heater Co., 209 E. Washington Ave., Jackson, Mich.
Handy & Harman, 82 Fulton St., New York 7, N. Y.
Hanlon-Waters, Inc., National Bank of Tulsa Bldg., Tulsa 1, Okla.
● Hansen Mfg. Co., Inc., Princeton 6, Ind.
Hardinge Oil Burner & Mfg. Co., 1770 Berteau St., Chicago, Ill.
Hardy, Inc., Charles, 420 Lexington Ave., New York, N. Y.
Hare Engineering Co., 155 W. Congress St., Detroit 26, Mich.
Harnischfeger Corp., 4400 W. National Ave., Milwaukee, Wis.
Harrington & King Perforating Co., 5655 Fillmore St., Chicago 44, Ill.
Harris Calorific Co., The, 5501 Cass Ave., N. W., Cleveland, O.
Harris & Co., Arthur, 210 N. Aberdeen St., Chicago, Ill.
Harrisburg Machinery Corp., 7th & Curtin St., Harrisburg, Pa.
Harrisburg Steel Corp., 10th & Herr Sts., Harrisburg, Pa.
Harry Cooling Towers, Inc., 554 W. 48th St., New York, N. Y.
Hart & Cooley Mfg. Co., Holland, Mich.
Hart Mfg. Co., The, Hamilton St., Hartford, Conn.
Hartmann Co., Chas., 985 Dean St., Brooklyn, N. Y.
Hartzell Propeller Fan Co., P. O. Box 909, Roosevelt Ave., Piqua, O.
Harvey-Whipple, Inc., Springfield, Mass.
Hasco Valve & Machine Co., 1819 W. St. Paul Ave., Milwaukee, Wis.
Haskell Mfg. Co., Wm. H., 20 Commerce St., Pawtucket, R. I.
Hastings Air Conditioning Co., Box 481, 108 S. Colorado Ave., Hastings, Nebr.
Haveg Corp., Newark, Del.
● Hays Corp., 782 E. 8th St., Michigan City, Ind.
Hays Mfg. Co., 801 W. 12th St., Erie, Pa.
Healy Ruff Co., 765 Hampden Ave., St. Paul, Minn.
Heartley Machine & Tool Co., 900-8 Summit St., Toledo, O.
Heat Transfer Products, Inc., 90 West St., New York 6, N. Y.
Heating Assurance, Inc., 124 E. Augusta St., Spokane, Wash.
Hegeler Zinc Co., P. O. Box 599, Danville, Ill.
Hendley & Whittemore, 6 Blackhawk Blvd., Beloit, Wis.
Hendrick Mfg. Co., 37 Dundaff St., Carbondale, Pa.
Henry Furnace Co., The., Medina, O.
● Henry Valve Co., 3260 W. Grand Ave., Chicago 51, Ill.
Henry & Wright Mfg. Co., 760 Windsor St., Hartford, Conn.
Herbert Boiler Co., 2300 Bloomingdale Ave., Chicago, Ill.
Her-Born Engineering & Mfg. Co., 212 Columbus Ave., Sandusky, O.
Herbusch Corp., The, 706 Chestnut St., 210 Title Guaranty Bldg., St. Louis 1, Mo.
Hercules Chemical Co., Inc., 332 Canal St., New York, N. Y.
Hercules Electric & Mfg. Co., Inc., 2416 Atlantic Ave., Brooklyn, N. Y.
Hercules Float Wks., 200 Franklin St., Springfield, Mass.
Hershey Machine & Foundry Co., Motorstoker Div., Manheim, Pa.
Hess Warming & Ventilating Co., 1211 S. Western Ave., Chicago, Ill.
Hetzel Roofing Products Co., 67 Maine St., Newark, N. J.
Highside Chemicals Co., 195 Verona Ave., Newark, N. J.
Hill Diesel Engine Co., Lansing, Mich.
Hill, E. Vernon, 6826 W. Highland Ave., Chicago, Ill.
Hilo Varnish Corp., 42-60 Stewart Ave., Brooklyn, N. Y.
Hinde & Dauch Paper Co., P.O. Box 861, Sandusky, O.
Hirschman Co., W. F., 1245 McKinley Parkway, Buffalo, N. Y.
Hobart Bros. Co., Troy 1, O.
Hodge Boiler Wks., Summer St., East Boston, Mass.

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Hodgman Mfg. Co., 135 Washington St., Taunton, Mass.
Hodgman Rubber Co., Framingham, Mass.
● Hoffman Specialty Co., 1001 York St., Indianapolis 7, Ind.
Holcomb & Hoke Mfg. Co., 1545 Van Buren, Indianapolis, Ind.
Hollands Mfg. Co., Erie, Pa.
Hollup Corp., Div. of National Cylinder Gas Co., 3357 W. 47th Pl., Chicago, Ill.
Holsclaw Bros., Inc., Evansville 11, Ind.
Holtum Mfg. Co., Freeport, Ill.
● Holtzer-Cabot Electric Co., 125 Amory St., Boston, Mass.
Homestead Valve Mfg. Co., P. O. Box 348, Coraopolis, Pa.
Hoppes Mfg. Co., 850 N. Belmont Ave., Springfield, O.
Horn Co.. A. C., 43-36 Tenth St., Long Island City, N. Y.
Horton Mfg. Co., 3016 University Ave., S. E., Minneapolis, Minn.
Hossfeld Mfg. Co., 460 W. Third St., Winona, Minn.
● Hotstream Heater Co., 8007 Grand Ave., Cleveland, O.
Houghton & Co., E. F., 303 W. Lehigh Ave., Philadelphia, Pa.
Hound Packing Co., 4757 E. Ravenswood Ave., Chicago, Ill.
Howard Iron Wks. & Alberger Heater Co., 287 Chicago St., Buffalo 4, N. Y.
Howe Ice Machine Co., 2825 Montrose Ave., Chicago, Ill.
Howell Electric Motors Co., Howell, Mich.
Howes-Woods Co., 201 Bridge St., Cambridge, Mass.
Hubbell Corp., 319 N. Albany Ave., Chicago, Ill.
Hugo Mfg. Co., 49th Ave., W., & Superior St., West Duluth 7, Minn.
Humboldt Mfg. Co., 2016 N. Whipple St., Chicago, Ill.
Hunt & Son, C. B., Salem, O.
Hunter Fan & Ventilating Co., Inc., 400 S. Front St., Memphis, Tenn.
Hussey & Co., C. G., 2850 Second Ave., Pittsburgh, Pa.
Huyette Co., Inc., Paul B.. 401 N. Broad St., Philadelphia 8, Pa.
Hyatt Bearings Div., General Motors Corp., Harrison, N. J.
Hynes Electric Heating Co., West and Clinton Sts., Camden, N. J.

I

Ice Cooling Appliance Corp., Morrison, Ill.
Ideal Commutator Dresser Co., 1096 Park Ave., Sycamore, Ill.
Ideal Electric & Mfg. Co., E. First & Oak Sts., Mansfield, O.
● Ilg Electric Ventilating Co., 2850 N. Crawford Ave., Chicago 41, Ill.
● Illinois Engineering Co., 2035 S. Racine Ave., Chicago 8, Ill.
● Illinois Iron & Bolt Co., 918 S. Michigan Ave., Chicago Ill.
Illinois Malleable Iron Co., 1801 Diversey Parkway, Chicago 14, Ill.
Illinois Oil Co., 4th Ave. and 24th St., Rock Island, Ill.
● Illinois Testing Laboratories. 420 N. La Salle St., Chicago, Ill.
Illinois Zinc Co., 2959 W. 47th St., Chicago, Ill.
Imperial Brass Mfg. Co., 1200 W. Harrison St., Chicago, Ill.
Imperial Electric Co., 64 Ira Ave., Akron, O.
Independent Pneumatic Tool Co., 600 W. Jackson Blvd., Chicago 6. Ill.
Independent Register Co., 3747 E. 93rd St., Cleveland 5, O.
Indian Trailer Corp., Koolroom Div., 2338 Indiana Ave., Chicago, Ill.
Industrial Engineering Corp., Terre Haute, Ind.
Industrial Mfg. & Engineering Co., 3845 N. Ravenswood Ave., Chicago 13, Ill.
Industrial Research, Lansdowne, Pa.
Industrial Service Laboratories, 7656 W. Forest Home Ave., Milwaukee. Wis.
Ingersoll Steel & Disc Div., Borg-Warner Corp., 310 S. Michigan Ave., Chicago, Ill.
● Ingersoll-Rand, 11 Broadway, New York, N. Y.
Inland Steel Co., 38 S. Dearborn St., Chicago 3. Ill.
Inner-Tite Clamp Corp., 18 W. Jersey St., Elizabeth, N. J.
Insto-Gas Corp.. 1900 E. Jefferson, Detroit 7, Mich.
Insulite Div. Minnesota and Ontario Paper Co., 500 Baker Arcade Bldg., Minneapolis 2, Minn.
Insul-Wool Insulation Corp., Wichita 12, Kans.
Inter-Coastal Paint Corp., 15th St., and Southern R. R., East St. Louis, Ill.
International Boiler Works, East Stroudsburg, Pa.
International Correspondence Schools, Scranton, Pa.
International Engineering, Inc., 1145 Bolander Ave., Dayton, O.
International Engineering Wks., Inc., Box 71, Framingham, Mass.
International Heater Co., 101 Park Ave., Utica 2, N. Y.
International Moistening Co., 489 S. Main St., Providence, R. I.
International Nickel Co., Inc., The, 67 Wall St., New York 5, N. Y.
International Nutyp Tool Co., 68 W. First St., Oswego, N. Y.
International Register Co., 2620 W. Washington Blvd., Chicago, Ill.
International Steel Co., 1545 Edgar St., Evansville, Ind.
International Vermiculite Co., 11th & Stanford Ave., Springfield, Ill.
Iona Ventilator Co., Inc., 2821-29 W. Dauphin St., Philadelphia 32, Pa.
Iowa Paint Mfg. Co., 118-20 Eighth St., Des Moines, Ia.
Iron Fireman Mfg. Co., 3121 W. 106th St., Cleveland 11, O.
Irvington Varnish and Insulator Co., 6 Argyle Terrace, Irvington 11, N. J.
Iwan Brothers, Inc., 1503 Prairie Ave., South Bend 14, Ind.

J

Jabsco Pump Co., 8306 Wilshire Blvd., Beverly Hills, Calif.
Jackson Co.. Byron, P. O. Box 2017, Terminal Annex, Los Angeles, Calif.
Jackson & Church Co., 321 N. Hamilton Ave., Saginaw, Mich.
Jacobs Co., B. & J., 1729 John St., Cincinnati, O.
Jaden Mfg. Co., Inc., F., 1601 Second St., Hastings, Nebr.
Jamar Co., Walker, 367 S. First Ave., E. Duluth, Minn.
Jamieson Mfg. Co., 820 Eagle Ford Rd., Dallas, Tex.
Janette Mfg. Co., 556 W. Monroe St., Chicago, Ill.
Jarecki Mfg. Co., 1345 W. 12th St., Erie, Pa.
Jefferson Electric Co., 25th & Madison St., Bellwood, Ill.
Jefferson Union Co., Inc., Lockport, N. Y.; and Lexington 73, Mass.
Jeffrey Mfg. Co., 859-99 N. Fourth St., Columbus, O.
● Jenkins Bros., 80 White St., New York, N. Y.
Jennison Co., 17 Putnam St., Fitchburg, Mass.
Jessop Steel Co., Washington, Pa.
● Jewel Mfg. Co., 1841 University Ave., St. Paul 4, Minn.
Joal Mfg. Corp., 2058 Canton St., Toledo, O.
Johns-Manville, 22 E. 40th St., New York 16, N. Y.
Johnson Bronze Co., 460 S. Mill St., New Castle, Pa.
Johnson Co., Lloyd S., 2241 Indiana Ave., Chicago 16, Ill.
Johnson Co., S. T., 940 Arlington St., Oakland 8, Calif; 401 N. Broad St., Philadelphia, Pa.
Johnson Corp., 892 Wood St., Three Rivers, Mich.
● Johnson Fan & Blower Corp., 1320 W. Lake St., Chicago, Ill.
Johnson Gas Appliance Co., 520 "E" Ave., N. W., Cedar Rapids, Ia.
Johnson Mfg. Co., 10th & Sycamore, Waterloo, Ia.
● Johnson Service Co., 507 E. Michigan St., Milwaukee, Wis.
Johnston Bros., Inc., Ferrysburg, Mich.
Johnston & Chapman Co., 2925 Carroll Ave., Chicago, Ill.
Johnston Co., William W., 115 Bayard St., Dayton, O.
Johnston Tin Foil & Metal Co., The, 6100 S. Broadway, St Louis 11, Mo.
Jones Foundry & Machine Co., W. A., 4401 Roosevelt Rd., Chicago 24, Ill.
Jones & Laughlin Steel Corp., Third Ave. & Ross St., Pittsburgh, Pa.
Jordan & Co., Paul R., 311 E. South St., Indianapolis, Ind.
Justus Steam Trap Co., Napanoch, N. Y.

K

Kainer & Co., 763 W. Lexington St., Chicago, Ill.
Kaiser Co., H. S., 3336 Franklin Blvd., Chicago. Ill.
Kaltenthaler Co., H. J., 236 Cherry St., Philadelphia 6, Pa.
Kane Mfg. Corp., Kane, Pa.
Kauffman Air Conditioning Corp., 4336 W. Pine Blvd., St. Louis. Mo.
Kaufman, H. J., 13215 Roselawn Ave., Detroit 4, Mich.
Kaye & MacDonald, Inc., 92 Franklin Ave., West Orange, N. J.
Keasbey Co., Robert A., 139-149 W. 19th St., New York, N. Y.
Keasbey & Mattison Co., Butler Ave., Ambler, Pa.
Keckley Co., O. C., 400 W. Madison St., Chicago, Ill.
Keeler Co., E., 238 West St., Williamsport 3, Pa.
Keeney Mfg. Co., Main St., Newington, Conn.
Kehm Corp., The, 135 S. La Salle St., Chicago 3, Ill.
Keldur Corp., 420 Lexington Ave., New York 17, N. Y.
Kellogg Co., M W., The, 225 Broadway, New York 7, N. Y.
Kelly-Koet, Covington, Ky.
Kelvin-White Co., 90 State St., Boston 9, Mass.
Kelvinator Div., Nash-Kelvinator Corp., 14250 Plymouth Rd. Detroit 32, Mich.
● Kennard, Inc., Sam, 4821 Easton Ave., St. Louis 13, Mo.
Kennedy, Inc., David E., 60 Second Ave., Brooklyn, N. Y.
● Kennedy Valve Mfg. Co., The, Elmira, N. Y.
Kerentoff, G. L., 2218 Reading Rd., Cincinnati 2, O.
Kernchen Co., 103 E. Wacker Drive, Chicago, Ill.
Kerotest Mfg. Co., 2525 Liberty Ave., Pittsburgh 22, Pa.
Kester Solder Co., 4201 Wrightwood Ave., Chicago 39, Ill.
● Kewanee Boiler Corp., Franklin St. and "Q" Tracks, Kewanee, Ill.
Key Co., 2700 McCasland, East St. Louis, Ill.
Keystone Asphalt Products Co., 43 E. Ohio St., Chicago, Ill.
Keystone Carbon Co., Inc., St. Marys, Pa.
Kidder Mfg. Co., Inc., J. F., 426 Colchester Ave., Burlington, Vt.
● Kieley & Mueller, Inc., 2013-2033 43rd St., North Bergen, N. J.
Kimball-Krogh Pump Div., Food Machinery Corp., 301 West Ave. 26, Los Angeles, Calif.
Kimberly-Clark Corp., Neenah, Wis.
Kinetic Chemicals, Inc., 10th & Market St., Wilmington, Del.
King Engineering Corp., 943 Willard Ave., Ann Arbor, Mich.
King Union Co., Inc., Hillsgrove, R. I.
King Ventilating Co., Box 178, Owatonna, Minn.
Kingsford Foundry & Machine Wks., 264 W. Second St., Oswego, N. Y.
Kingston Products Corp., 1415 N. Webster, Kokomo, Ind.
Kinney Mfg. Co., 3529 Washington St., Boston 30, Mass.
Kirk & Blum Mfg. Co., 2838-52 Spring Grove Ave., Cincinnati, O.
Kisco Boiler & Engineering Co., 3732 Chouteau Ave., St. Louis, Mo.
Klauer Mfg. Co., 9th and Washington Sts., Dubuque, Ia.
Klee Co., Geo. B., 2162-6 Dana Ave., Cincinnati 7, O.
Kleenaire Corp., 409 Jefferson St., Stevens Point, Wis.
Kleen-Heet, Inc., 1823 Carroll Ave., Chicago 12, Ill.
Klingerit, Inc., 16-22 Hudson St., New York, N. Y.
Klipfel Mfg. Co., 2651 W. Harrison St., Chicago, Ill.

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Klomparens Lock-Joint Co., 3015 Military Rd., Arlington, Va.
Kluegel & Co., E., 187 W. Kellogg Blvd., St. Paul, Minn.
Knickerbocker Co., 603 Liberty St., Jackson, Mich.
Knight, Maurice A., Kelley Ave., Akron, O.
Knowles Mushroom Ventilator Co., 11 Label St., Montclair, N. J.
Kohler Co., Kohler, Wis.
Kol-Master Corp., Oregon, Ill.
Kopperman & Sons, Joseph, 316 New St., Philadelphia 6, Pa.
Koppers Co., Bartlett Hayward Div., 200 Scott St., Baltimore, Md.
Korfund Co., 48-15 32nd Pl., Long Island City 1, N. Y.
Koven & Bro., L. O., Inc., 154 Ogden Ave., Jersey City, N. J.
Kraissl Co., Inc., The, Terhune and Williams Aves, Hackensack, N. J.
● Kramer Trenton Co., 626 Brunswick Ave., Trenton, N. J.
Krehbiel Co., J. H., 425 N. Crawford Ave., Chicago, Ill.
Krez Co., Paul J., 444 N. LaSalle St., Chicago, Ill.
Krueger Sentry Gauge Co., 109 N. Pearl St., Green Bay, Wis.
Kuhlman Electric Co., Detroit Electric Furnace Div., Bay City, Mich.
Kuhns Bros. Co., 1800 McCall St., Dayton 8, O.
Kunkle Valve Co., 121 N. Clinton St., Ft. Wayne 2, Ind.
Kwikon Co., 626 W. Jackson Blvd., Chicago, Ill.

L

L-R Mfg. Co., Blower Div., Torrington, Conn.
La Bour Co., Inc., The, 1301 Sterling Ave., Elkhart, Ind.
Laclede-Christy Clay Products Co., 411 N. Seventh St., St. Louis, Mo.
Laclede Steel Co., Arcade Bldg., Rm. 1317, St. Louis 1, Mo.
Laclede Stoker Co., 4438 Hunt Ave., St. Louis 10, Mo.
La Crosse Steel Roofing & Corrugating Co., 227 Jay St., La Crosse, Wis.
La Crosse Tractor Co., La Crosse, Wis.
La-Del Conveyor & Mfg. Co., S. Broadway and Mill Ave., New Philadelphia, O.
Ladish Drop Forge Co., Fittings Div., Cudahy, Wis.
Lamb & Ritchie Co., 250 Albany St., Cambridge, Mass.
Lammert & Mann Co., 281 N. Wood St., Chicago. Ill.
Lamneck Products, Inc., 1025 Lamneck St., Middletown, O.
Lamson & Sessions Co., 1971 W. 85th St., Cleveland, O.
Landis Machine Co., Inc., 5th & Church Sts., Waynesboro, Pa.
Larkin Coils, Inc., 519 Memorial Dr., S. E., Atlanta, Ga.
Larkin Packer Co., 6200 Maple Ave., St. Louis, Mo.
Lastik Products Co., Inc., 1106 Keenan Bldg., Pittsburgh 22, Pa.
Lau Blower Co., 2001 Home Ave., Dayton 7, O.
Lawler Automatic Controls, 453 N. MacQuesten Pkwy., Mount Vernon, N. Y.
Lawrence Pump & Engine Co., P. O. Box 70, Lawrence, Mass.
Layne & Bowler, Inc., Box No. 215, Hollywood Sta., Memphis 8, Tenn.
Lead Lined Iron Pipe Co., 1 Broadway, Wakefield, Mass.
Leavitt Machine Co., East River St., Orange, Mass.
Lecourtenay Co., 5 Maine St., Newark 5, N. J.
Lee Engineering Co., Union National Bank Bldg., Youngstown 3, O.
Lee Co., K. O., Aberdeen, S. D.
Lee & Son Co., Thomas, 128-132 W. Second St., Cincinnati, O.
● Leeds & Northrup Co., 4970 Stenton Ave., Philadelphia 44, Pa.
Leffel & Co., James, 426 East St., Springfield, O.
Lehigh Fan & Blower Co., Front & Linden Sts., Allentown, Pa.
Lehon Co., 4411 S. Oakley Ave., Chicago, Ill.
Leinweber Fan & Blower Co., 8448 Crandon, Chicago, Ill.
● Leland Electric Co., 1501 Webster St., Dayton, O.
Lennox Furnace Co., Marshalltown, Ia., Syracuse, N. Y., and Columbus, O.
Leonard Valve Co., Elmwood Station, Providence 7, R. I.
Leslie Co., Valley Brook & Grant Aves., Lyndhurst, N. J.
Leslie Welding Co., 2943 Carroll Ave., Chicago, Ill.
Levow, David, 308 W. 20th St., New York 11, N. Y.
Lewellen Mfg. Co., Columbus, Ind.
Lewin-Mathes Co., Lewin Metals Div., 12th and Chateau Sts., St. Louis, Mo.
Lewis & Co., Inc., Chas. S., 2207 Pine St., St. Louis, Mo.
Lewis Laboratories, Inc., Paul, 924 N. Fourth St., Milwaukee, Wis.
Leyman Mfg. Corp., John H. McGowan Co. Div., 1416 First National Bank Bldg., Cincinnati, O.
Libbey-Owens-Ford Glass Co., Nicholas Bldg., Toledo 3, O.
● Lilie-Hoffman Cooling Towers, Inc., 4239 Duncan Ave., St. Louis, Mo.
Limbert & Co., Geo. B., 570 Fulton St., Chicago 6, Ill.
● Lincoln Electric Co., The, 12818 Coit Rd., Cleveland 1, O.
Linde Air Products Co., The, Unit of Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.
Lindsay & Lindsay, 222 W. Adams St., Chicago 6, Ill.
Linear Packing & Rubber Co., Inc., N. W. Cor. State Rd. & Levick St., Philadelphia 35, Pa.
● Link-Belt Co., 307 N. Michigan Ave., Chicago 1; 300 W. Pershing Rd., Chicago 9, and 2410 W. 18th St., Chicago 8, Ill.; 519 N. Holmes Ave. and 220 S. Belmont Ave., Indianapolis 6, Ind.; 2045 W. Hunting Park Ave., Philadelphia 40, Pa.
Lintern Co., Berea, O.
Lion Mfg. Corp., 2701-11 Belmont Ave., Chicago, Ill.
Liquid Carbonic Corp., 3100 S. Kedzie Ave., Chicago, Ill.
Liquidometer Corp., 37-15 Skillman Ave., Long Island City 1, N. Y.
Lissberger & Son, Inc., Marks, 23-01 Borden Ave., Long Island City, N. Y.
Little Mfg. Co., M. S., 151 New Park Ave., Hartford 6, Conn.
Littleford Bros., 453 E. Pearl St., Cincinnati 2, O.
Locke Regulator Co., 76 North St., Salem, Mass.
Lockformer Co., The, 4615 Arthington St., Chicago, Ill.
Lockjoint Wood Products Co., 1721 Mildred St., Wichita 7, Kans.
Locknut Corp. of America, 3403 W. 47th St., Chicago, Ill.
Logan Engineering Co., Lawrence & Lamon Ave., Chicago 30, Ill.
Lohman Co., Wm. J., 1206 S. Grove St., Irvington, N. J.
Lonergan Co., J. E., 2nd and Race Sts., Philadelphia 6, Pa.
Lonergan Mfg. Co., Albion, Mich.
Long Mfg., Div. Borg-Warner Corp., 12501 Dequindre St., Detroit, Mich.
Lonn Mfg. Co., Inc., 500 N. Dearborn St., Chicago, Ill.
Lookout Boiler & Mfg. Co., Compress St. & Mfrs. Rd., Chattanooga, Tenn.
Lord Mfg. Co., 1633 W. 12th St., Erie, Pa.
Lovejoy Flexible Coupling Co., 5024 W. Lake St., Chicago 44, Ill.
Lowell Air Conditioning Corp., Otis Bldg., Philadelphia, Pa.
Lowell Wrench Co., 54 Commercial St., Worcester 8, Mass.
Loyal Knight Stokers, Inc., 800 Scheel St., Belleville, Ill.
Ludlow Valve Mfg. Co., Inc., Foot of Adams St., Troy, N. Y.
Ludowici-Celadon Co., 104 S. Michigan Ave., Chicago, Ill.
Lukens Steel Co., 308 S. First Ave., Coatesville, Pa.
Lumm Co., A. H., 2512 Albion St., Toledo, O.
Lumsden & Van Stone Co., 426 First St., South Boston, Mass.
Lunkenheimer Co., Waverly & Beekman Sts., Cincinnati 14, O.
Luzerne Rubber Co., Muirhead Ave., Trenton 9, N. J.
Lynch Mfg. Corp., Defiance, O.
Lynchburg Foundry Co., Peoples Bank Bldg., Lynchburg, Va.
Lyon, Conklin & Co., Inc., McComas & Race Sts., Baltimore 30, Md.

M

Maas & Waldstein Co., 438 Riverside Ave., Newark 4, N. J.
Machlett & Son, E., 220 E. 23rd St., New York, N. Y.
Macksons Co., 125 Cedar St., New York, N. Y.
MacLean-Fogg Lock Nut Co., 2653 N. Kildare, Chicago, Ill.
Magirl Foundry & Furnace Wks., P. H., 413 E. Oakland Ave., Bloomington, Ill.
Magnet Switch Co., 340 W. Huron St., Chicago 10, Ill.
Mahon Co., R. C., 8650 Mt. Elliott Ave., Detroit, Mich.
● Maid-O'-Mist, Inc., 215 N. Aberdeen St., Chicago 7, Ill.
Maintenance Engineering Corp., 3611 Clinton Dr., Houston, Tex.
Majestic Co., 733 Erie St., Huntington, Ind.
Major Controls Sales Div., 12 Norfolk St., Cambridge, Mass.
Mall Tool Co., 7740 S. Chicago Ave., Chicago, Ill.
Malleable Iron Fittings Co., Branford, Conn.
Mallory Sales Co., 13904 Lincoln Ave., Dolton, Ill.
Manhattan Perforated Metal Co., Inc., 43-17 37th St., Long Island City, N. Y.
Manhattan Rubber Mfg., Div. of Raybestos-Manhattan, Inc., 61 Willett St., Passaic, N. J.
Manheim Mfg. & Belting Co., Manheim, Pa.
Manitowoc Boiler Wks., 16th & The River, Manitowoc, Wis.
Manley Products Corp., State & Hay Sts., York, Pa.
Manufacturers Fin Coil Co., 2505 S. Pulaski Rd., Chicago 23, Ill.
Manufacturers Machine Co., Railroad Ave., North Andover, Mass.
Maple Valley Mfg. Co., First St., Mapleton, Ia.
Maplewood Machinery Co., Inc., 2634 Fullerton Ave., Chicago, Ill.
Marathon Electric Mfg. Corp., Cherry and Randolph Sts., P. O. Box 298, Wausau, Wis.
Marble-Card Electric Co., Gladstone, Mich.
Marblehead Lime Co., 160 N. LaSalle St., Chicago, Ill.
● Marley Co., 3001 Fairfax Rd., Kansas City 15, Kans.
Marlin-Rockwell Corp., Jamestown, N. Y.
● Marlo Coil Co., 6135 Manchester Ave., St. Louis, Mo.
Marquette Mfg. Co., 401 Johnson St., Minneapolis, Minn.
Marsh Corp., Jas. P., 2073 Southport Ave., Chicago 14, Ill.
Marsh Tritrol Co., 600 S. Michigan Ave., Chicago 5, Ill.
Marsh Valve Co., 4th St. & Brigham Rd., Dunkirk, N. Y.
Marshalltown Mfg. Co., 901 E. Nevada, Marshalltown, Ia.
Martens & Stormoen, 15 Hathaway St., Boston 10, Mass.
Martin, J. O. & C. U., 637 Minna St., San Francisco, Calif.
Martin Fan & Blower Co., 1051 W. 16th St., Chicago 8, Ill.
Martin & Sons, H. P., 801 W. 12th St., Owensboro, Ky.
● Martocello & Co., Jos. A., 229 N. 13th St., Philadelphia, Pa.
Mason-Neilan Regulator Co., 1190 Adams St., Boston, Mass.
Masonite Corp., 111 W. Washington St., Chicago 2, Ill.
Master Electric Co., 126 Davis Ave., Dayton 1, O.
Matthiessen & Hegeler Zinc Co., 9th & Sterling Sts., La Salle, Ill.
Mauck Seamless Copper Tank Corp., Victor, 309 E. Main, Norristown, Pa.
Maurath, Inc., 7309 Union Ave., Cleveland, O.
● May Oil Burner Corp., Maryland Ave. and Oliver, Baltimore, Md.
Mayflower Air-Conditioners, Inc., 5th Floor, Finch Ind. Bldg., St. Paul, Minn.
Mayne Products Co., 324 Harris Bldg., Dayton 2, O.
Mayson Mfg. Co., Inc., 4332 Horatio St., Detroit 10, Mich.
Maysteel Products, Inc., Horicon St., Mayville, Wis.
McAlear Mfg. Co., 1901-1909 S. Western Ave., Chicago 8, Ill.
McAuley Trap Co., 405 Penn Ave., Pittsburgh 22, Pa.
McCann Furnace Co., 5005 Euclid Ave., Cleveland, O.
● McCord Radiator & Mfg. Co., 2587 E. Grand Blvd., Detroit, Mich.
McCorkle Co., D. H., 6th & Bancroft Way, Berkeley 2, Calif.
● McDonnell & Miller, 400 N. Michigan Ave., Chicago 11, Ill.

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McKay Co., York, Pa.
McLeod & Henry Co., Inc., Troy, N. Y.
McPherson Furnace & Supply Co., 1805 N. E. Second Ave., Portland 12, Ore.
McQuay, Inc., 1600 Broadway, N. E., Minneapolis, Minn.
McQuay-Norris Mfg. Co., Southwest Ave. at Marconi, St. Louis 10, Mo.
McWane Cast Iron Pipe Co., 1201 Vanderbilt Rd., Birmingham 2, Ala.
Mears-Kane-Ofeldt, Inc., 1903-1915 E. Hagert St., Philadelphia, Pa.
Medart Co., 3500 DeKalb, St. Louis, Mo.
Meier Electric & Machine Co., 3525 E. Washington St., Indianapolis, Ind.
Mellish & Murray Co., 1715 Carroll Ave., Chicago, Ill.
Merchant & Evans Co., 2035 Washington Ave., Philadelphia 46, Pa.
● Mercoid Corp., The, 4201 Belmont Ave., Chicago, Ill.
Merco-Nordstrom Valve Co., 400 N. Lexington Ave., Pittsburgh 8, Pa.
Mercury Clutch Corp., 2049 Dueber Ave., Canton 6, O.
Meriam Co., The, 1985 W. 112th St., Cleveland, O.
Merrell Mfg. Co., 644 Curtis St., Toledo, O.
Mesker & Co., Geo. L., 400 N. W. First St., Evansville 8, Ind.
Metal Products Fabricating Co., 119 Kansas St., San Francisco, Calif.
Metal & Thermit Corp., 120 Broadway, New York, N. Y.
Metallo Gasket Co., 16 Bethany St., New Brunswick, N. J.
Metropolitan Refining Co., Inc., 23-28 50th Ave., Long Island City, N. Y.
● Mettler Co., Lee B., 406 S. Main St., Los Angeles 13, Calif.
Meyer & Bro. Co., F., 1313 S. Adams St., Peoria, Ill.
Meyer Furnace Co., The, 1300 S. Washington St., Peoria 2, Ill.
Meyer Mfg. Co., 2536 Fourteenth St., Detroit, Mich.
Micheli Air Conditioning Co., Inc., 1725 State St., Schenectady, N. Y.
Michigan Pipe Co., 503 Phoenix Bldg., Bay City, Mich.
Micro Products Co., 20 N. Wacker Dr., Chicago, Ill.
Micro Switch Corp., 1 E. Spring St., Freeport, Ill.
Middleton Mfg. & Sales Co., 125 N. First St., Minneapolis, Minn.
Midland Paint & Varnish Co., 9115 Reno Ave., Cleveland, O.
● Midwest Piping & Supply Co., Inc., Second and Barry St., St. Louis, Mo.
Milburn Co., Alexander, 1426 W. Baltimore St., Baltimore, Md.
Milcor Steel Co., S. 41st & Burnham Sts., Milwaukee 4, Wis.
Miller Electric Mfg. Co., Inc., 905 N. Meade St., Appleton, Wis.
Millers Falls Co., 57 Wells St., Greenfield, Mass.
Mills Corp., Elmer E., 153-159 W. Huron St., Chicago 10, Ill.
Mills Industries, Inc., 4110 W. Fullerton Ave., Chicago, Ill.
Milwaukee Gas Specialty Co., 2025 W. Clybourn St., Milwaukee, Wis.
Milwaukee Valve Co., S. Burrell St. at E. Hayes Ave., Milwaukee, Wis.
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Modern Engineering Co., 3411 Pine Blvd., St. Louis 3, Mo.
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Moeller Instrument Co., 132nd St. & 89th Ave., Richmond Hill, N. Y.
Mojonnier Bros. Co., 4601 W. Ohio St., Chicago, Ill.
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Moncrief Furnace Co., P. O. Box 1673, Atlanta, Ga.
Monitor Controller Co., The, 51 S. Gay St., Baltimore 2, Md.
Monmouth Products Co., 1929-41 E. 61st St., Cleveland 3, O.
Monsanto Chemical Co., 1700 S. Second St., St. Louis 4, Mo.
Monsanto Chemical Co., Merimac Div., Everett, Mass.
Montag Stove & Furnace Wks., 2011 N. Columbia Blvd., Portland, Ore.
Montgomery Bros., 61 Fremont St., San Francisco, Calif.
Moore Steam Turbine Div., Worthington Pump & Machinery Corp., Wellsville, N. Y.
Moran Flexible Steam Joint Co., 217 W. Main St., Louisville, Ky.
Morehead Mfg. Co., 2455 W. Warren Ave., Detroit 8, Mich.
Morey & Jones, Ltd., 922 S. Hemlock St., Los Angeles 21, Calif.
Morris Machine Wks., 50 E. Genesee St., Baldwinsville, N. Y.
Morrison Products, Inc., E. 168th St. and Waterloo Rd., Cleveland, O.
Morse Chain Co., Turner Pl., Ithaca, N. Y.
● Mortell Co., J. W. Kankakee, Ill.
Motex Metal Process Corp., 4473-4475 W. Jefferson Ave., Detroit, Mich.
Mouat Vapor Heating Co., The, 1246-1254 W. 4th St., Cleveland, O.
Mountain States Equipment Co., 1238 Speer Blvd., Denver 4, Colo.
Mueller Brass Co., Port Huron, Mich.
Mueller Co., 512 W. Cerro Gordo St., Decatur B, Ill.
● Mueller Furnace Co., L. J., 2005 W. Oklahoma Ave., Milwaukee 7, Wis.
Mueller Steam Specialty Co., Inc., 40-20 22nd St., Long Island City, N. Y.
Multi-Cell Sales Corp., 3420 Nicollet Ave., Minneapolis 8, Minn.
Muncie Gear Wks., Inc., 700 N. Wysor, Muncie, Ind.
● Mundet Cork Corp., 65 S. 11th St., Brooklyn, N. Y.
Mundt & Sons, Charles, 53 Fairmount Ave., Jersey City 4, N. J.
Munn & Steele, Inc., 130 Lister Ave., Newark 5, N. J.
Murray Iron Wks. Co., 1106 Washington St., Burlington, Ia.
● Murray Mfg. Co., D. J., 1002-24 Third St., Wausau, Wis.
Mutual Chemical Co. of America, 270 Madison Ave., New York, N. Y.
Myers & Bro. Co., F. E., The, Ashland, O.
Myers Electric Co., Inc., 410 Third Ave., Pittsburgh 19, Pa.

N

● Nash Engineering Co., Wilson Ave., South Norwalk, Conn.
Nason Co., 7663 Epworth Blvd., Detroit 4, Mich.
National Airoil Burner Co., Inc., 1284 E. Sedgley Ave., Philadelphia 34, Pa.
National Aluminate Corp., 6615 W. 66th Pl., Chicago, Ill.
National Brass Co., 1603 Madison Ave., Grand Rapids 2, Mich.
National Brass & Copper Co., Inc., P. O. Box 365, Lisbon, O.
National Carbon Co., Carbon Products Div., P. O. Box 6087, Cleveland 1, O.
National Cylinder Gas Co., 205 W. Wacker Dr., Chicago, Ill.
National Engineering & Mfg. Co., 213 W. 19th St., Kansas City, Mo.
National Engineering Products, Inc., Commerce and Savings Bldg., Washington, D. C.
National Gypsum Co., Delaware Ave., Buffalo, N. Y.
● National Heater Co., 401 Essex Bldg., Minneapolis, Minn.
National Lead Co., 111 Broadway, New York 6, N. Y.
National Machine Wks., 122 S. Michigan Ave., Chicago, Ill.
National Mfg. Corp., 151 Fillmore Ave., Tonawanda, N. Y.
National Mfg. & Engineering Co., 1441 Brooklyn Ave., Detroit, Mich.
National Metal Products Corp., 21 N. Loomis St., Chicago, Ill.
National Meter Co., 4221 First Ave., Brooklyn 32, N. Y.
National Pipe Bending Co., 122 River St., New Haven 13, Conn.
National Radiator Co., The, 221 Central Ave., Johnstown, Pa.
National Safety Device Co., 836 W. Hubbard, Chicago, Ill.
National Steam Pump Co., 701 W. Johnson St., Upper Sandusky, O.
National Time & Signal Corp., 600 E. Milwaukee Ave., Detroit, Mich.
National Tube Co., United States Steel Corp. Subsidiary, Frick Bldg., Pittsburgh 19, Pa.
National Valve & Mfg. Co., 3101 Liberty Ave., Pittsburgh 1, Pa.
Naugatuck Mfg. Co., Union City, Conn.
Naylor Pipe Co., 1251 E. 92nd St., Chicago, Ill.
Nebel Mfg. Co., P. O. Box 3942, Shaker Sta., Cleveland, O.
Neemes Foundry, Inc., 216 First St., Troy, N. Y.
Nelson Chemical Pumps, Box 2235, Casper, Wyo.
Nelson Co., 2604 Fourth Ave., Detroit, Mich.
● Nelson Corp., Herman, 1824 Third Ave., Moline, Ill.
Nelson Mfg. Co., B. F., 401 Main St., N. E., Minneapolis 13, Minn.
Neptune Meter Co., 50 W. 50th St., New York 20, N. Y.
● Nesbitt, Inc., John J., State Rd. & Rhawn St., Philadelphia 36, Pa.
Nevinger Mfg. Co., Inc., Greenville, Ill.
New Albany Machine Mfg. Co., E. 10th & Water Sts., New Albany, Ind.
New Departure Div., General Motors Corp., Bristol, Conn.
● New England Cooling Tower Co., 32 Cambridge St., Charles Sta., Boston, Mass.
New Haven Copper Co., Seymour, Conn.
New Jersey Zinc Sales Co., Front & Fletcher Sts., New York 7, N. Y.
New York Air Valve Corp., 611-621 Broadway, New York, N. Y.
New York Blower Co., 3155 Shields Ave., Chicago 16, Ill.
New York Brass Foundry, 405 Broome St., New York, N. Y.
Newark Wire Cloth Co., 351 Verona Ave., Newark, N. J.
Newman Brothers, Inc., 666 W. Fourth St., Cincinnati, O.
Newman Co., Inc., I. C., 6 E. 45th St., New York, N. Y.
Newport Rolling Mill Co., Div. of The Andrews Steel Co., Ninth & Lowell Sts., Newport, Ky.
Niagara Blower Co., 6 E. 45th St., New York 17, N. Y.
Niagara Machine & Tool Wks., 637-697 Northland Ave., Buffalo 11, N. Y.
Nice Ball Bearing Co., 30th and Nicetown Lane, Philadelphia 40, Pa.
Nicholson & Co., W. H., 12 Oregon St., Wilkes-Barre, Pa.
Niles Rolling Mill Co., Niles, O.
Noera Mfg. Co., Div. Chase Brass & Copper Co., Waterbury Conn.
Norgren Co., C. A., 222 Santa Fe Dr., Denver, Colo.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
Norman Sheet Metal Mfg. Co., W. F., 212-236 N. Cedar St., Nevada, Mo.
Norristown Magnesia & Asbestos Co., Washington St., Norristown, Pa.
North American Fibre Products Co., The, Standard Bldg., Cleveland 13, O.
North American Mfg. Co., 2910 E. 75th, Cleveland, O.
North Penn Co., 72 Fifth Ave., New York, N. Y.
Northern Blower Co., 6409 Barberton Ave., Cleveland, O.
Northern Equipment Co., 1945 Grove Drive, Erie, Pa.
Northern Indiana Brass Co., 935 Plum St., Elkhart, Ind.
Northern Steel & Stoker Corp., 3100 Prospect Rd., Peoria, Ill.
Northern Weatherstrip Co., 367 S. First Ave., E. Duluth, Minn.

● Advertisement in this issue. See Index to Advertisers, page 322.

Northwest Lead Co., 2700 16th Ave., S.W., Seattle 4, Wash.
Northwest Stove & Furnace Wks., Inc., 2345 S.E. Gladstone St., Portland 2, Ore.
Norwin Co., E. Album St., Freeport, Ill.
Norwood Filtration Co., The, N. Maple St., Florence, Mass.
Nu-Way Corp., 2416 4th Ave., Rock Island, Ill.
Nye Tool & Machine Co., 4120-30 Fullerton Ave., Chicago 39, Ill.

O

Oakite Products, Inc., 22 Thames St., New York 6, N. Y.
Oberdorfer Brass Co., M. L., 2307 Thompson Rd., Syracuse, N. Y.
O'Brien Steam Specialty Co., 205 Harrison St., Syracuse 2, N. Y.
O'Brien Varnish Co., South Bend, Ind.
Ohio Brass Co., 380 N. Main St., Mansfield, O.
Ohio Electric Mfg. Co., 5906 Maurice Ave., Cleveland, O.
Ohio Injector Co., Wadsworth, O.
Ohio Pattern Works & Foundry Co., 2735 Colerain Ave., Cincinnati 25, O.
Ohio Pipe Bending & Machine Co., 3900-3910 Trent Ave., Cleveland 9, O.
Ohio Products Co., 16113 Munn Rd., Cleveland, O.
Ohl & Son, George A., 159 Oraton St., Newark, N. J.
Ohmlac Paint & Refining Co., 6550 S. Central Ave., Chicago, Ill.
Oil Well Supply Co., Oil City, Pa.
Olsen Testing Machine Co., Tinius, 12th and Buttonwood Sts., Philadelphia, Pa.
O'Malley Valve Co., Edward, 231 E. 95th St., Chicago, Ill.
● O'Neil Irwin Mfg. Co., 316 Eighth Ave., S., Minneapolis 15, Minn.
Ormsby-Osterman, Inc., 3631 Cass Ave., St. Louis, Mo.
● Orr & Sembower, Inc., Box 1138, Reading, Pa.
Osborn Co., The J. M. & L. A., 1541 E. 38th St., Cleveland 14, O.
Oster Mfg. Co., 2057 E. 61st Pl., Cleveland, O.
Ostlind Valve, Inc., Portland, Ore.
OverSpred Stoker Co., 77 W. Washington St., Chicago 2, Ill.
● Owens-Corning Fiberglas Corp., Nicholas Bldg., Toledo, O.
Ozalid Products Div., General Aniline & Film Corp., Ansco Rd., Johnson City, N. Y.
Ozone Air Co., 928 Cherry St., S.E., Grand Rapids, Mich.

P

Pacific Lumber Co., The, 100 Bush St., San Francisco 4, Calif.
Pacific Pump Works, 5716 Bickett St., Huntington Park, Calif.
Pacific States Felt & Mfg. Co., Inc., 845 Howard St., San Francisco, Calif.
Pacific Steel Boiler Div., United States Radiator Corp., 1500 United Artists Bldg., Detroit, Mich.
Packless Metal Products Corp., 31 Winthrop Ave., New Rochelle, N. Y.
Page Steel & Wire, Div. of American Chain & Cable Co., Inc., Monessen, Pa.
Paine Co., 2951 W. Carroll Ave., Chicago 12, Ill.
Pains Fireworks Display Co., 11 Park Pl., New York, N. Y.
Palmer Co., 2501 Norwood Ave., Cincinnati (Norwood) 12, O.
Palmer Electric Co., 20 Sproat St., Detroit, Mich.
Palmer Mfg. Corp., Phoenix, Ariz.
Palnut Co., 73 Cordier St., Irvington, N. J.
Pan-American Engineering Co., 820 Parker St., Berkeley, Calif.
Pangborn Corp., Pangborn Blvd., Hagerstown, Md.
Paragon Electric Co., 37 W. Van Buren St., Chicago 5, Ill.
Paragon-Revolute Corp., 65 South Ave., Rochester, N. Y.
Paramount Products Co., 545 Fifth Ave., New York, N. Y.
Parker Appliance Co., The, 17325 Euclid Ave., Cleveland, O.
Parker-Kalon Corp., 200 Varick St., New York 14, N. Y.
Parkersburg Iron & Steel Co., Parkersburg, W. Va.
Parks-Cramer Co., P.O. Box 444, Fitchburg, Mass.
Patent Novelty Co., 312 Eighth St., Fulton, Ill.
Patrol Valve Co., The, 2310 E. Superior Ave., Cleveland 14, O.
Patten Co., J. V., 500 De Kalb Ave., Sycamore, Ill.
Patterson-Ballagh Corp., 1900 E. 65th St., Los Angeles, Calif.
● Patterson-Kelley Co., Inc., East Stroudsburg, Pa.
Payne Furnace & Supply Co., Inc., 336-338 N. Foothill Rd., Beverly Hills, Calif.
Peabody Engineering Corp., 580 Fifth Ave., New York 19, N. Y.
Pease Co., C. F., The, 2601 W. Irving Park Rd., Chicago, Ill.
Peck & Harvey, 4327 W. Addison St., Chicago, Ill.
Peck, Stow & Wilcox Co., Center St., Southington, Conn.
Pecora Paint Co., Inc., 3501 N. 4th St., Philadelphia 40, Pa.
● Pedrick Tool & Machine Co., 3640 N. Lawrence St., Philadelphia 40, Pa.
Peerless of America, Inc., 333 N. Michigan Ave., Chicago, Ill.
Peerless Electric Co., 3021 W. Market St., Warren, O.
Peerless Mfg. Corp., 1400 W. Ormsby St., Louisville, Ky.
● Peerless Pump Div., Food Machinery Corp., 1250 Camden Ave., S.W., Canton, O.
Peerless Unit Ventilation Co., Inc., 810 Union Ave., Bridgeport, Conn.
Penberthy Injector Co., 1242 Holden Ave., Detroit 2, Mich.
● Penn Electric Switch Co., Box 556, Goshen, Ind.
Penn Mfg. Corp. of Washington, Pa., 380 W. Chestnut St., P.O. Box 484, Washington, Pa.
Penn Ventilating Co., 3252 Goodman St., Philadelphia, Pa.
Pennsylvania Engineering Wks., 526 S. Jefferson St., New Castle, Pa.
Pennsylvania Flexible Metallic Tubing Co., 72nd St. and Powers Lane, Philadelphia 42, Pa.
Pennsylvania Forge Co., Milnor & Bleigh Sts., Philadelphia, Pa.
Pennsylvania Pump & Compressor Co., Easton, Pa.
Pennsylvania Salt Mfg. Co., Widener Bldg., Philadelphia 7, Pa.
%Proportioneers, Inc. %, 9 Codding St., Providence 1, R. I.
Perfect Circle Co., The, Hagerstown, Ind.
Perfection Grate & Stoker Co., 4 Fisk Ave., Springfield, Mass.
Perfection Refrigeration Parts Co., Harvey, Ill.
Perfex Corp., 500 W. Oklahoma Ave., Milwaukee 7, Wis.
Perkins Machine Co., 4 Perkins Ave., Warren, Mass.
Perkins & Son, Inc., B. F., Chicopee St., Holyoke, Mass.
Permatex Co., Inc., Sheepshead Bay, N. Y.
Permutit Co., 330 W. 42nd St., New York 18, N. Y.
Pernot & Rich, Inc., 2546 San Fernando Rd., Los Angeles 41, Calif.
Peters-Dalton, Inc., 628 E. Forest Ave., Detroit 1, Mich.
● Petroleum Heat & Power Co., Stamford, Conn.
Petrometer Corp., 1 Star Sq., Long Island City, N. Y.
Pfening Co., Fred D., 1075 W. 5th Ave., Columbus 8, O.
Phelps Dodge Copper Products Corp., British American Tube Div., 40 Wall St., New York, N. Y.
Phelps Mfg. Co., 801 Thomas St., Little Rock, Ark.
Philadelphia Gear Works, Inc., Erie Ave. & G St., Philadelphia, Pa.
Philadelphia Pipe Bending Co., 4135-65 N. Fifth St., Philadelphia, Pa.
Philadelphia Thermometer Co., 915 Filbert St., Philadelphia, Pa.
Philco Corp., Tioga and C Sts., Philadelphia 34, Pa.
Phillips & Co., H. A., 3255 W. Carroll Ave., Chicago, Ill.
Phillips Cooling Tower Co., Inc., 114 Liberty St., New York 6, N. Y.
Phoenix Brass Fittings Corp., Colt St. & Chancellor Ave., Irvington 11, N. J.
Phoenix Ice Machine Co., 2711 Church St., Cleveland, O.
Phoenix Ventilator Co., Inc., 1665 63rd St., Brooklyn, N. Y.
Photoswitch, Inc., 77 Broadway, Cambridge 42, Mass.
Pick Mfg. Co., West Bend, Wis.
Pier Equipment Mfg. Co., 1440 Milton St., Benton Harbor, Mich.
Pierce Butler Radiator Corp., 701 Nichols Ave., Syracuse 6, N. Y.
Pierce Co., Wm. B., The, 41 N. Division St., Buffalo, N. Y.
Pilley Brush Co., Fort Madison, Ia.
Pines Engineering Co., Inc., 650 Prairie St., Aurora, Ill.
Pioneer Heat Regulator Div., Master Electric Co., The, 100 Davis Ave., Dayton, O.
Pioneer Roofing & Sheet Metal Co., 226 N. Main St., Muskogee, Okla.
Pipe Fabrication Institute, 1108 Clark Bldg., Pittsburgh, Pa.
Pittsburgh Brass Mfg. Co., 3155 Penn Ave., Pittsburgh, Pa.
Pittsburgh Equitable Meter Co., 400 N. Lexington Ave., Pittsburgh 8, Pa.
Pittsburgh Lectrodryer Corp., P.O. Box 1766, Pittsburgh 30, Pa.
Pittsburgh Pipe Coil & Bending Co., 61 Bridge St., Etna, Pa.
Pittsburgh Piping & Equipment Co., 43rd St. & A. V. R. R., Pittsburgh, Pa.
Pittsburgh Plate Glass Co., 2000 Grant Bldg., Pittsburgh, Pa.
Pittsburgh Steel Co., Grant Bldg., Pittsburgh, Pa.
Pittsburgh Tube Co., Hagan Bldg., 323 Fourth Ave., Pittsburgh 22, Pa.
Pittsburgh Valve & Fittings Corp., Barberton, O.
Pittsburgh Water Heater Corp., Box 4452, Pittsburgh 5, Pa.
Plant Rubber & Asbestos Works, 537 Brannan St., San Francisco 7, Calif.
Plastergon Wall Board Co., Philadelphia Ave., Buffalo 7, N. Y.
Plastic Products Co., 6475 Georgia Ave., Detroit 11, Mich.
Pleasantaire Corp. of America, Tower Bldg., Washington 5, D. C.
Plibrico Jointless Firebrick Co., 1800 Kingsbury St., Chicago, Ill.
Plumb Mfg. Co., 1925 Dwyer Ave., Utica 3, N. Y.
Plummer Spray Equipment Co., 700 Filmore St., Napoleon, O.
Plymouth Industries, Inc., 1932 Harrison Ave., Plymouth, Ind.
Pocahontas Fuel Co., Inc., Stoker Div., 340 E. 131st St., Cleveland, O.
Poe Co., C. W., The, Mayfield at Lee, Cleveland 18, O.
Pomona Pump Co. Div., Joshua Hendy Iron Works, 206 E. Commercial St., Pomona, Calif.
Poole Foundry & Machine Co., 1700 Union Ave., Woodberry, Baltimore, Md.
● Porter & Co., Inc., H. W., 825 Frelinghuysen Ave., Newark, N. J.
Powell Co., Wm., 2525 Spring Grove Ave., Cincinnati, O.
Power King Tool Corp., P.O. Box 150, Warsaw, Ind.
Power Piping Div., Blaw Knox Co., 829 Beaver Ave., Pittsburgh, Pa.
● Powers Regulator Co., 2720 Greenview Ave., Chicago, Ill.
Practical Instrument Co., 2717 N. Ashland Ave., Chicago, Ill.
Prat-Daniel Corp., Port Chester, N. Y.
Precision Control Co., 899 Bryant St., San Francisco, Calif.
Precision Scientific Co., 1750 N. Springfield Ave., Chicago, Ill.
Precision Thermometer & Instrument Co., 1434 Brandywine St., Philadelphia, Pa.
Preferred Utilities Co., Inc., 1860 Broadway, New York 23, N. Y.
Premier Furnace Co., Box 150, Dowagiac, Mich.
Presstite Engineering Co., 3900 Chouteau St., St. Louis, Mo.
Pritchard & Co., J. F., Fidelity Bldg., Kansas City, Mo.
Propellair, Inc., 1345 Lagonda Ave., Springfield, O.
Protected Steel Products Co., McAdams Ave., Washington, Pa.
● Prox Co., Inc., Frank, 1201 S. First St., Terre Haute, Ind.
Puhl & Hepper Mfg. Co., Inc., 6400 W. Florissant Ave., St. Louis 20, Mo.
Pure Carbonic, Inc., 60 E. 42nd St., New York 17, N. Y.
Pyle-National Co., The, 1334 N. Kostner Ave., Chicago 51, Ill.
Pyott Foundry & Machine Co., 328 N. Sangamon St., Chicago, Ill.
Pyrolite Products Co., 1221-1231 W. 74th St., Cleveland 2, O.
Pyrometer Instrument Co., 103 Lafayette St., New York, N. Y.

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Q

Quaker City Iron Wks., Allegheny & Tulip Sts., Philadelphia 34, Pa.

Quaker Rubber Corp., Comly & Milnor Sts., Philadelphia 24, Pa.

Quickwork Div., Whiting Corp., Harvey, Ill.

Quiet Heet Mfg. Co., 135 New Jersey R. R. Ave., Newark, N. J.

Quigley Co., Inc., 56 W. 45th St., New York, N. Y.

Quimby Pump Div., H. K. Porter Co., Inc., 340 Thomas St., Newark 5, N. J.

R

● R-S Products Corp., Germantown Ave. at Wayne Junction, Philadelphia, Pa.

R. U. V. Engineering Corp., 110 E. 42nd St., New York, N. Y.

Radiator Specialty Co., 1722 Dowd Rd., Charlotte, N. C.

Rafter Machine Co., 259 Stephens St., Belleville, N. J.

Raisler Corp., Grimes Sprinkler Div., 129 Amsterdam Ave., New York, N. Y.

Ramsey Chain Co., Inc., 1029 Broadway, Albany, N. Y.

Ramtite Co., The. 2563 W. 18th St., Chicago, Ill.

Ranco, Inc., 601 W. 5th Ave., Columbus 1, O.

● Randall Graphite Products Corp., 609 W. Lake St., Chicago 6, Ill.

Ransome Machinery Co., Subsidiary of Worthington Pump & Machinery Corp., Dunellen, N. J.

Ravena Iron Co., Ravena, N. Y.

Rawlplug Co., Inc., The. 98 Lafayette St., New York, N. Y.

Ray Oil Burner Co., 401-499 Bernal Ave., San Francisco 12, Calif.

● Reading-Pratt & Cady Div., American Chain & Cable Co., Inc., Reading, Pa.

Red Jacket Mfg. Co., Davenport. Ia.

Red Spot Electric Co., 7405 S. Tacoma Way, Tacoma 9, Wash.

Reed Unit-Fans, Inc., 1001 St. Charles Ave., New Orleans, La.

Reeves Pulley Co., 1000 N. Wilson St., Columbus, Ind.

Reeves Steel & Mfg. Co., Dover, O.

Refinite Corp., Refinite Bldg., Omaha 8, Neb.

Refractory & Insulation Corp., 120 Wall St., New York 5, N. Y.

Refrigeration Appliances, Inc., 917-923 W. Lake St., Chicago Ill.

Refrigeration Economics Co., Inc., 1232 Second St., N. E., Canton, O.

Rega Mfg. Co., 79 Mt. Hope Ave., Rochester 7, N. Y.

Register & Grille Mfg. Co., Inc., 70 Berry St., Brooklyn, N. Y.

Reichert Float & Mfg. Co., 2238 Smead Ave., Toledo, O.

Reif-Rexoil, Inc., 37-41 Carroll St., Buffalo, N. Y.

Reilly Tar & Chemical Corp., 1615 Merchants Bank Bldg., Indianapolis 4, Ind.

Reiner & Campbell Co., Inc., 667 Norwood Terrace, Elizabeth, N. J.

Reliable Perforating Co., 2047 N. Wood St., Chicago, Ill.

Reliable Sheet Metal Engineering Co., 4334-50 S. Knox, Chicago, Ill.

Reliance Automatic Lighting Co., 1929 Mead St., Racine, Wis.

Reliance Electric & Engineering Co., Ivanhoe Rd., Cleveland 10, O.

Reliance Gauge Column Co., 5902 Carnegie Ave., Cleveland, O.

Reliance Refrigerating Machine Co., 3401 N. Kedzie Ave., Chicago, Ill.

Rempe Co., 340 N. Sacramento Blvd., Chicago, Ill.

Rensselaer Valve Co., Ontario St., Cohoes, N. Y.

Reps Tool Co., Inc., 99 Wall St., New York, N. Y.

Republic Flow Meters Co., 2240 Diversey Pkwy., Chicago, Ill.

Republic Rubber Div., Lee Rubber & Tire Corp., Youngstown, O.

Republic Steel Corp., Republic Bldg., Cleveland, O.

Republic Steel Corp., Bolt & Nut Div., 1500 Scranton Rd., Cleveland, O.

Research Corp., Chrysler Bldg., New York, N. Y.

● Research Products Corp., 1015 E. Washington Ave., Madison 3, Wis.

Resisto Pipe & Valve Co., 262 Bridge St., East Cambridge, Mass.

Resistoflex Corp., Belleville, N. J.

Revere Copper & Brass, Inc., 230 Park Ave., New York 17, N. Y.

Rex Clay Products Co., 14414 Dexter Blvd., Detroit, Mich.

Reynolds Electric Co., 2603 W. Congress St., Chicago 12, Ill.

Reynolds Mfg. Co., The, 412 Prospect St., N. E., Grand Rapids, Mich.

Reynolds Mfg. Co., Inc., Springfield, Mo.

Reynolds Metals Co., Reynolds Metals Bldg., Richmond 19, Va.

● Reznor Mfg. Co., Mercer, Pa.

● Rhoads & Sons, J. E., 35 N. Sixth St., Philadelphia, Pa.

Rhode Island Fittings Co., Hillsgrove, R. I.

Rhode Island Humidifier & Ventilating Co., 99 Chauncy St., Boston 11, Mass.

Rhodes, Inc., M. H., 30 Bartholomew Ave., Hartford, Conn.

Richmond Engineering Co., Inc., 7th and Hospital Sts., Richmond, Va.

Richmond Radiator Co., Gas Products Div., Uniontown, Pa.

● Ric-wiL Co., 1562 Union Commerce Bldg., Cleveland 14, O.

Ridge Tool Co., Clark St., Elyria, O.

Rid-Sludge Chemical Co., 1316 Third St., N., Minneapolis 11, Minn.

Riggin Metal Products, Inc., Box 267, Kankakee, Ill.

Riley Stoker Corp., 9 Neponset St., Worcester, Mass.

Robbins & Myers, Inc., Lagonda Ave., Springfield, O.

Roberts-Gordon Appliance Corp., 137 Arthur St., Buffalo 7, N. Y.

Roberts Tube Works, 2500 Military Ave., Detroit, Mich.

Robertson Co., H. H., 2400 Farmers Bank Bldg., Pittsburgh 22, Pa.

Robinson Insulation Co., Great Falls, Mont.

Rochester Lead Works, Inc., 380 Exchange St., Rochester, N. Y.

Rochester Mfg. Co., Inc., 100 Rockwood St., Rochester 10, N. Y.

Rock Island Register Co., 2435 Fifth Ave., Rock Island, Ill.

Rock River Machine Co., Inc., N. Main St., Janesville, Wis.

Rockwood Mfg. Co., 1801-2001 English Ave., Indianapolis, Ind.

Rockwood Sprinkler Co., 38 Harlow St., Worcester, Mass.

Roessing Mfg. Co., 1616 Noble St., Sharpsburg Branch, Pittsburgh, Pa.

Roller Bearing Co. of America, Whitehead Rd., Trenton 3, N. J.

Rolyan Corp., 2241 Indiana Ave., Chicago, Ill.

Rome-Turney Radiator Co., Canal St., Rome, N. Y.

Roots-Connersville Blower Corp., 16th St. & Columbia Ave., Connersville, Ind.

Roper Corp., Geo. D., Blackhawk Park Ave., Rockford, Ill.

Rosebraugh Co., W. W., 680 S. 17th St., Salem, Ore.

Rosedale Foundry & Machine Co., Columbus & Preble Aves., N. S., Pittsburgh, Pa.

Ross Engineering Corp., J. O., 350 Madison Ave., New York 17, N. Y.

Ross Heater & Mfg. Co., Inc., 1407 West Ave., Buffalo, N. Y.

Ross Sprinkler Co., 34 Roberts St., Pasadena. Calif.

Ross Valve Mfg. Co., Inc., 6 Oakwood Ave., Troy, N. Y.

Rotary Mfg. Co., 5718 Long Beach Ave., Los Angeles, Calif.

Rotary Seal Co., 2020 N. Larrabee St., Chicago, Ill.

Roxalin Flexible Finishes, Inc., 800 Magnolia Ave., Elizabeth, N. J.

Roy Pumps, Milton, 1371 E. Mermaid Ave., Philadelphia 18, Pa.

Royal Air Conditioning Equipment Co., 1024 Westminster Ave., Alhambra, Calif.

Royal Ventilator Co., 415 Locust St., Philadelphia 6, Pa.

Royersford Foundry & Machine Co., Inc., 102-132 Main St., Royersford, Pa.

Ruberoid Co., 500 Fifth Ave., New York, N. Y.

Ruby Chemical Co., 74 McDowell St., Columbus, O.

Ruehfel Co., Inc., George, 101 Menahan St., Brooklyn, N. Y.

● Ruemelin Mfg. Co., 3860 N. Palmer St., Milwaukee 12, Wis.

Ruggles-Klingemann Mfg. Co., 4 Foster Ct., Salem, Mass.

Ruppright, Siegfried, 5019 Florence Ave., Bell, Calif.

Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

Russell Co., F. C., 1836 Euclid Ave., Cleveland, O.

Russell Electric Co., 348 W. Huron St., Chicago 10, Ill.

Russell Mfg. Co., John M., Box 246, Naugatuck, Conn.

● Rutland Fire Clay Co., Curtis Ave., Rutland, Va.

Ruud Mfg. Co., 2934 Smallman St., Pittsburgh, Pa.

Ryerson & Son, Inc., Jos. T., 2558 W. 16th St., Chicago, Ill.

Ryniker Steel Products Co., 122-124 N. 25th St., Billings, Mont.

S

SKF Industries, Inc., Front St. & Erie Ave., Philadelphia, Pa.

St. Paul Corrugating Co., Wabasha and Water Sts., St. Paul, Minn.

Sac Tool Mfg. Co., 1913 Washington Ave., St. Louis, Mo.

Sales & Co., Murray W., 801 W. Baltimore Ave., Detroit 2, Mich.

Salina Metal Products Co., 9th and Bishop, Salina, Kans.

● Sall Mountain Co., 176 W. Adams St., Chicago 3, Ill.

Sampsel Time Control, Inc., Spring Valley, Ill.

Samson-United Corp., 1700 University Ave., Rochester, N. Y.

Sandberg Sheet Metal Works, 500 N. E. Union Ave., Portland, Ore.

Sangamo Electric Co., 1301 N. 11th St., Springfield, Ill.

● Sarcotherm Controls, Inc., 222 W. North Bank Drive, Chicago 54, Ill.

● Sarco Co., Inc., 475 Fifth Ave., New York 17, N. Y.

Sauereisen Cements Co., Sharpsburg Station, Pittsburgh 15, Pa.

Saunders Machine & Tool Corp., 25 Atherton St., Yonkers, N. Y.

Saverite Engineering Co., 1031 Clinton St., Hoboken, N. J.

Sawyer Electrical Mfg. Co., 5701 Smithway, Los Angeles, Calif.

Scaife Co., 26 Ann St., Oakmont, Pa.

Scanlan-Morris Co., Madison 4, Wis.

Schade Valve Mfg. Co., 2527 N. Bodine St., Philadelphia 33, Pa.

Schatz Mfg. Co., Fairview, Poughkeepsie, N. Y.

Schaub Engineering Co., Fred H., 325 W. Huron St., Chicago, Ill

Schecter Brothers Co., Hancock and Huntingdon Sts., Philadelphia, Pa.

Schieren Co., Chas. A., 30-38 Ferry St., New York, N. Y.

Schmieg Industries, 312-320 Piquette Ave., Detroit, Mich.

Schneible Co., Claude B., 2827 25th St., Detroit 32, Mich.

Schoedinger, F. O., 322-358 Mt. Vernon Ave., Columbus 16, O.

Schramm, Inc., West Chester, Pa.

Schubert-Christy Corp., Box No. 725, Indio, Calif.

Schundler & Co., Inc., F. E., 45-15 Vernon Blvd., Long Island City, N. Y.

Schutte & Koerting Co., 12th and Thompson Sts., Philadelphia, Pa.

Schwitzer-Cummins Co., 1125 Massachusetts Ave., Indianapolis, Ind.

Scientific Instrument Co., 531-535 W. Larned, Detroit 26, Mich.

Scott-Newcomb, Inc., 1922 Pine St., St. Louis, Mo.

Scott Valve Mfg. Co., 3963 McKinley Ave., Detroit, Mich.

Sealed Power Corp., Muskegon 61, Mich.

Sealkote Corp., 400 N. Sangamon St., Chicago, Ill.

Seamlex Co., Inc., 27-27 Jackson Ave., Long Island City, N. Y.

Season-Aire Corp. of America, 20 Bartlett St., Detroit, Mich.

Selas Co., The, Erie Ave. and D St., Philadelphia, Pa.

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Sellers Engineering Co., 4860 N. Clark St., Chicago, Ill.
Semco Mfg. Co., 118-122 Third Ave., N., Nashville, Tenn.
Semet-Solvay Engineering Corp., 40 Rector St., New York, N. Y.
Semler Co., Jeannette, Pa.
Servel, Inc., Electric Refrigeration & Air Conditioning Div., 119 Morton Ave., Evansville 20, Ind.
Service To Industry, Box 133, West Hartford, Conn.
Service Machine Co., 158 Miller St., Elizabeth 4, N. J.
Shafer Bearing Corp., 35 E. Wacker Dr., Chicago, Ill.
Shallcross Co., 48th and Grays Ferry Rd., Philadelphia, Pa.
Shallcross Controls, Inc., 121 N. Broadway, Milwaukee, Wis.
Shank Co., Cyrus, 625 W. Jackson Blvd., Chicago, Ill.
Sharon Steel Corp., Sharon, Pa.
Shaw Co., Benjamin F., Second & Lombard Sts., Wilmington 99, Del.
Shaw-Kendall Engineering Co., 120-130 S. Superior St., Toledo, O.
Shaw-Perkins Mfg. Co., Oliver Bldg., Pittsburgh, Pa.
● Sheetlock Co., 4521 N. Clark St., Chicago 40, Ill.
Sheet Metal Mfg. Co., Inc., 953 Myrtle Ave., Brooklyn, N. Y.
Sheffler-Gross Co., Drexel Bldg., Philadelphia, Pa.
Sherwin-Williams Co., The, 101 Prospect Ave., N.W., Cleveland, O.
Shreveport Engineering Co., Inc., 1553-55 Texas Ave., Shreveport, La.
Sight Feed Generator Co., 14-18 N. 10th St., Richmond, Ind.
Signal Electric Mfg. Co., Menominee, Mich.
Signal Indicator Co., 140 Cedar St., New York, N. Y.
Silvercote Products, Inc., 161 E. Erie St., Chicago 11, Ill.
Simplex Ceiling Co., 60 E. 42nd St., New York 17, N. Y.
Simplex Heating Specialty Co., Inc., 1105 Church St., Lynchburg, Va.
Simplex Mfg. Co., 198 N. Main St., Fond du Lac, Wis.
Simplex Oil Heating Corp., 85 Main St., West Orange, N. J.
Sims Co., 18th & Whitley Sts., Erie, Pa.
Sinker-Davis Co., 230 S. Missouri St., Indianapolis 4, Ind.
Sipe & Co., James B., Box 8010 S. Hills Branch, Pittsburgh, Pa.
Skidmore Corp., St. Joseph, Mich.
Skilbeck Mfg. Co., 7432 27th Ave., Kenosha, Wis.
Skilsaw, Inc., 5033 Elston Ave., Chicago 30, Ill.
Skinner Co., M. B., South Bend, Ind.
Skinner Engine Co., 337 W. 12th St., Erie, Pa.
● Skinner Heating & Ventilating Co., Inc., Div. of St. Louis Blow Pipe & Heater Co., 1954 N. 9th St., St. Louis 6, Mo.
Skinner Irrigation Co., 1212 E. Canal St., Troy, O.
Skuttle Mfg. Co., 517 E. Larned St., Detroit 26, Mich.
Slater Mfg. Co., 24 Water St., Wakefield, Mass.
Sly Mfg. Co., W. W., 4700 Train Ave., Cleveland 2, O.
Small Motors, Inc., 1322 Elston Ave., Chicago, Ill.
● Smith Co., Inc., H. B., The, 57 Main, Westfield, Mass.
Smith, Inc., James Campbell, 1679 Collamer Rd., Cleveland, O.
Smith, Inc., Winfield, H., 144 Eaton St., Springville, Erie County, N. Y.
Smith & Kanzler Corp., 516-534 Lidgerwood Ave., Elizabeth 2, N. J.
Smith Mfg. Co., Inc., F. A., P.O. Box 509, Rochester 2, N. Y.
Smith-Raymond Co., 1231-33 Tenth Ave., Columbus, Ga.
Smith Twin Tubular Boiler Co., Inc., Cottman St., at State Rd., Philadelphia, Pa.
Smith Welding Equipment Corp., 2633 S.E. Fourth St., Minneapolis 14, Minn.
Smolensky Valve Co., Inc., 1931 W. 47th St., Cleveland, O.
Smooth-On Mfg. Co., 568-574 Communipaw Ave., Jersey City 4, N. J.
Snap-On Tools Corp., Kenosha, Wis.
Solar Aircraft Co., San Diego, Calif.
Solvay Sales Corp., 42 Rector St., New York, N. Y.
Somers, Inc., H. J., 6063 Wabash Ave., Detroit, Mich.
Somerville Iron Wks., Somerville, N. J.
Sonneborn Sons, Inc., L., 88 Lexington Ave., New York, N. Y.
Sonner Burner Co., Winfield, Kans.
South Bend Air Products Corp., 304 E. Colfax Ave., South Bend, Ind.
South Chester Tube Co., Front & Thurlow Sts., P.O. Box 60, Chester, Pa.
Southbridge Roofing Co., Inc., Hartwell and Chapin Sts., Southbridge, Mass.
Souther Iron Co., E. E., 1952 Kienlen Ave., St. Louis 20, Mo.
Southern States Iron Roofing Co., Stiles Ave., Savannah, Ga.
● Spang-Chalfant, Div. of National Supply Co., Grant Bldg., Pittsburgh, Pa.
Specialty Converters, Inc., East Braintree, Mass.
Speedmaster Co., The, 1203 Thacker St., Des Plaines, Ill.
Speedway Mfg. Co., 1834 S. 52nd Ave., Chicago (Cicero), Ill.
Spence Engineering Co., Inc., 32 Grant St., Walden, N. Y.
Spencer Heater Div., The Aviation Corp., 164 Park St., Williamsport, Pa.
Spencer Thermostat Co., 34 Forest St., Attleboro, Mass.
Spencer Turbine Co., 486 New Park Ave., Hartford 6, Conn.
● Spoehrer-Lange Co., 3723 Commonwealth St., St. Louis, Mo.
Spray Engineering Co., 112 Central St., Somerville 45, Mass.
● Spraying Systems Co., 4031 W. Lake St., Chicago 24, Ill.
Sprayo-Flake Co., 2715 Irving Park Blvd., Chicago, Ill.
Spray-Wheel Air Conditioners, Inc., 1320 Nineteenth St., Denver, Colo.
Sprout-Waldron & Co., Muncy, Pa.
Square D Co., 6060 Rivard St., Detroit 11, Mich.
Square D Co., Industrial Controller Div., 4041 N. Richards St., Milwaukee 12, Wis.
Squires Co., C. E., The, E. 40th St. & Kelley Ave., Cleveland 3, O.
Stainless & Steel Products Co., 1000 Berry Ave., St. Paul, Minn.
Standard Asbestos Mfg. Co., 820-822 W. Lake St., Chicago 7, Ill.
Standard Computing Scale Co., The, Air Conditioning and Refrigeration Div., 2461 E. Grand Blvd., Detroit, Mich.
Standard Engineering Wks., 289 Roosevelt Ave., Pawtucket, R. I.
Standard Fuel Engineering Co., 667 Post Ave., S., Detroit, Mich.
Standard Furnace & Supply Co., 413-17 S. Tenth St., Omaha, Neb.
Standard Galvanizing Co., 2619 W. Van Buren St., Chicago, Ill.
Standard Heater & Oil Equipment Co., 245 Cornelison Ave., Jersey City 2, N. J.
Standard Lime & Stone Co., 2004 First National Bank Bldg., Baltimore, Md.
Standard Pressed Steel Co., Jenkintown, Pa.
Standard Reseater Corp., 423 W. 126th St., New York 27, N. Y.
Standard Rolling Mills, Inc., 143 Jewel St., Brooklyn, N. Y.
Standard Stamping & Perforating Co., 3131 W. 49th Pl., Chicago, Ill.
Standard Thermometer, Inc., 65 Shirley St., Boston, Mass.
Standard Transmission Equipment Co., Suite 330, 416 W. 8th St., Los Angeles, Calif.
Standard Tube Co., 14600 Woodward Ave., Highland Park, Mich.
Standard Ventilator Co., Lewisburg, Pa.
Stanley Electric Tool Div., The Stanley Works, Elm St., New Britain, Conn.
Staples & Pfeiffer, Ltd., 528 Bryant St., San Francisco, Calif.
● Star Electric Motor Co., 197 Grove St., Bloomfield, N. J.
Star Expansion Bolt Co., 147 Cedar St., New York 6, N. Y.
Star Mfg. Co., Inc., 530 Kinsley Ave., Providence, R. I.
Star Products Co., 130 Walnut Ave., New York 54, N. Y.
Starr Piano Co., Richmond, Ind.
Steamaire Co., Cincinnati, O.
Steel City Electric Co., 1201 Columbus Ave., Pittsburgh, Pa.
Steel Improvement & Forge Co., 974 E. 64th St., Cleveland 14, O.
Steel Products Engineering Co., 1205 W. Columbia St., Springfield, O.
Steel and Tubes, Div. of Republic Steel Corp., 224 E. 131st St., Cleveland, O.
Steinhorst & Sons, Inc., Emil, 612 South St., Utica, N. Y.
● Stephens-Adamson Mfg. Co., 55 Ridgeway Ave., Aurora, Ill.
Sterling Electric Motors, Inc., 5401 Telegraph Rd., Los Angeles 22, Calif.
Sterling Engineering & Mfg. Corp., 114 Business St., Hyde Park 36, Mass.
● Sterling, Inc., 3738 N. Holton St., Milwaukee 11, Wis.
Stewart Ice Machine Co., 1046 E. 22nd St., Los Angeles, Calif.
Stewart Mfg. Co., 309 Washington St., Orange, N. J.
Stewart-Rogers, Inc., 3915 Powelton Ave., Philadelphia 4, Pa.
Stewart-Warner Corp., 1826-1852 Diversey Parkway, Chicago 14, Ill.
Stickle Steam Specialties Co., 2215 Valley Ave., Indianapolis, Ind.
Stockham Pipe Fittings Co., 4100 Tenth Ave., N., Birmingham, Ala.
Stok-A-Fire Co., 6504 Olive St., University City, 5, Mo.
Stokermatic Co., 1415 S. State St., Salt Lake City 4, Utah
Stokes Rubber Co., Jos., Taylor & Webster, Trenton, N. J.
Stow Mfg. Co., 400 State St., Binghamton, N. Y.
Straight Line Foundry & Machine Corp., Direct Separator Div., The, 218 S. Geddes St., Syracuse, N. Y.
Strandwitz & Co., Inc., W. J., Jefferson and Master Sts., Camden, N. J.
Strong, Carlisle & Hammond Company, 1392 W. Third St., Cleveland, O.
Struthers Dunn, Inc., 1321 Arch St., Philadelphia, Pa.
Struthers Wells Corp., Titusville, Pa.
Stuart Co., W. W., 417 Ninth St., Des Moines, Iowa.
Sturtevant Co., B. F., Damon St., Hyde Park, Boston, Mass.
Sudbury Laboratory, South Sudbury, Mass.
Sullivan Valve & Engineering Co., 910 S. Arizona St., Butte, Mont.
Sundstrand Machine Tool Co., Pump Div., 2531 11th St., Rockford, Ill.
Sun-Fire Stoker Corp., New Albany, Ind.
Super Mold Corp., 402 N. Sacramento St., Lodi, Calif.
Super Radiator Corp., 652 Stinson Blvd., Minneapolis, Minn.
Superior Railway Products Corp., 7501 Thomas Blvd., Pittsburgh, Pa.
Superior Sheet Steel Co., The, Division of Continental Steel Corp., Canton-Louisville Rd., Canton, O.
Superior Steel Corp., Grant Bldg., Pittsburgh, Pa.
Superior Valve and Fittings Co., 1509 W. Liberty Ave., Pittsburgh 26, Pa.
Superstat Co., 38 Walter St., Springfield, Mass.
Supreme Air Filter Co., 126 W. 21st St., New York, N. Y.
Supreme Electric Products Corp., 194 Vassar St., Rochester 7, N. Y.
Supreme Heater & Ventilating Corp., 1911 N. Market St., St. Louis, Mo.
Surface Combustion, 2375 Dorr St., Toledo, O.
Swaby Mfg. Co., 2330 W. Cermak Rd., Chicago 8, Ill.
Swaine Mfg. Co., Fred J., 1300 N. Seventh St., St. Louis, Mo.
Swartwout Co., 18511 Euclid Ave., Cleveland, O.
Swift Mfg. Co., 247 McDougall Ave., Detroit, Mich.
Swoboda, Inc., H. O., 13th St., New Brighton, Pa.
Syntron Co., Homer City, Pa.

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Taber Pump Co., 272 Elm St., Buffalo 3, N. Y.
Taco Heaters, Inc., 342 Madison Ave., New York, N. Y.
Tagliabue Mfg. Co., C. J., 550 Park Ave., Brooklyn 5, N. Y.
Tallmadge & Co., Webster, 364 Glenwood Ave., East Orange, N. J.
Talon, Inc., Steel Tube Div., Oil City, Pa.
Tal's Prestal Bender, Inc., 225 N. Water St., Milwaukee, Wis.
Tamms Silica Co., 228 N. LaSalle St., Chicago, Ill.
● Taylor Forge & Pipe Wks., P. O. Box 485, Chicago 90, Ill.
Taylor-Hall Welding Corp., 99 Hope Ave., Worcester 3, Mass.
Taylor Instrument Companies, 95 Ames St., Rochester 1, N. Y.
Taylor-Winfield Corp., 1052 Mahoning Ave., N. W., Warren, O.
Technical Ply-Woods, 228 N. LaSalle St., Chicago 1, Ill.
Techtmann Industries, Inc., 828 N. Broadway, Milwaukee, Wis.
Tecumseh Products Co., Tecumseh, Mich.
Telsit Insulation Co., 1933 West Farms Rd., Bronx, N. Y.
Tempil Corp., 132 W. 22nd St., New York, N. Y.
Templeton Bros., 189 Belgrade Ave., Roslindale Station, Boston, Mass.
Templeton Mfg. Co., 114 Business St., Hyde Park 36, Mass.
Temprite Products Corp., 47 Piquette Ave., Detroit 2, Mich.
● Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham 2, Ala.
Tennessee Products Corp., American National Bank Bldg., Nashville, Tenn.
Tenney Engineering, Inc., 8 Elm St., Montclair, N. J.
Terry Steam Turbine Co., The, P. O. Box 1200, Hartford 1, Conn.
Textite Corp., 2110 Roscoe St., Chicago, Ill.
Thatcher Furnace Co., Centre St., Garwood, N. J.
Thermal Co., Inc., 1434 N. Fourth St., Milwaukee, Wis.
Thermal Engineering Co., 2967 S. LaSalle St., Chicago 16, Ill.
Thermal Syndicate, Ltd., The, 12 E. 46th St., New York, N. Y.
Therminsul Corp., 1603 Fulford St., Kalamazoo, Mich.
Thermoid Rubber, Div. of Thermoid Co., Whitehead Rd., Trenton 6, N. J.
Thermo-Mix, Inc., 4009 21st St., Long Island City, N. Y.
Thomas Co., Arthur H., W. Washington Square, Philadelphia, Pa.
Thompson & Co., Box 6757, Pittsburgh, Pa.
Thomson-Gibb Electric Welding Co., 161 Pleasant St., Lynn, Mass.
● Thrush & Co., H. A., Peru, Ind.
Thwing-Albert Instrument Co., Penn and Pulaski Sts., Philadelphia, Pa.
Tierney Rotor Ventilator Co., 239 Fourth Ave., S., Minneapolis, Minn.
Tiffin Eaves Trough Clamp Co., 25 Miami, Tiffin, O.
● Tilco-Fin, Inc., 58 Second Ave., Brooklyn, N. Y.
Timken Roller Bearing Co., 1835 Dueber Ave., S. W., Canton 6, O.
Timken Roller Bearing Co., Steel and Tube Div., Canton 6, O.
Tippett & Wood, Morris and Warren Sts., Phillipsburg, N. J.
Titeflex Metal Hose Co., 500 Frelinghuysen Ave., Newark, N. J.
Titusville Iron Wks. Co., S. Franklin St., Titusville, Pa.
● Todd Combustion Equipment, Inc., 601 W. 26th St., New York 1, N. Y.
Toledo Pipe Threading Machine Co., 1445 Summit St., Toledo 4, O.
Tomlee Tool & Engineering Co., 253 Third Ave., S., Minneapolis 15, Minn.
Torchweld Equipment Div., National Cylinder Gas Co., 1035 W. Lake St., Chicago, Ill.
Torit Mfg. Co., 292 Walnut St., St. Paul 2, Minn.
Tork Clock Co., Inc., 1 Grove St., Mt. Vernon, N. Y.
Torrington Co., The, Torrington, Conn.
Torrington Mfg. Co., 70 Franklin St., Torrington, Conn.
Trade-Wind Motorfans, Inc., 5725 S. Main St., Los Angeles, Calif.
Trageser Copper Wks., Inc., 5000 Grand Ave., Maspeth, Long Island, N. Y.
● Trane Co., The, La Crosse, Wis.
Trent Co., Harold E., Leverington Ave. and Wilde St., Philadelphia, 27, Pa.
Trerice Co., H. O., 1420 W. Lafayette Blvd., Detroit 16, Mich.
Triangle Mfg. Co., 396 Division St., Oshkosh, Wis.
Trimont Mfg. Co., 55-71 Amory St., Roxbury, Boston 19, Mass.
Trimount Instrument Co., 37 W. Van Buren St., Chicago 5, Ill.
Trimount Rotary Power Co., 398 Whiting Ave., East Dedham, Mass.
Trindl Products, Ltd., 2227-AD Calumet Ave., Chicago, Ill.
Triplex Heating Specialty Co., 252 N. Grant, Peru, Ind.
Triumph Ice Machine Co., 110-116 E. 70th St., Cincinnati, O.
Tropical Paint & Oil Co., 1244-86 W. 70th St., Cleveland, O.
Troy Engine & Machine Co., Troy, Pa.
Truflo Fan Co., 523 Main St., Harmony, Pa.
Trumbull Electric Mfg. Co., Woodford Ave., Plainville, Conn.
Truscon Steel Co., 1315 Albert St., Youngstown 1, O.
Tryco Products, Inc., Railroad Sq., Westfield, Mass.
● Tube Turns, 238 E. Broadway, Louisville, Ky.
Turco Products, Inc., 6135 S. Central Ave., Los Angeles 1, Calif.
Turner Brass Wks., 823-47 Park Ave., Sycamore, Ill.
Tuthill Pump Co., 939 E. 95th St., Chicago, Ill.
Tuttle Air Filter Co., Inc., 1014 W. Main St., Louisville 2, Ky.
● Tuttle & Bailey, Inc., Corbin Ave., New Britain, Conn.
XXth Century Heating & Ventilating Co., 96 Ira Ave., Akron, O.

U

U. S. Electrical Motors, Inc., 200 E. Slauson Ave., Los Angeles 54, Calif.
U. S. Electrical Tool Co., 1050 Findlay St., Cincinnati 14, O.
U. S. Expansion Bolt Co., P. O. Box 827, State St. & P. R. R., York, Pa.
U. S. Machine Corp., Lebanon, Ind.
U. S. Motors Corp., Oshkosh, Wis.
Uehling Instrument Co., 473 Getty Ave., Paterson 3, N. J.
Una Welding, Inc., 1615 Collamer Ave., E., Cleveland 10, O.
Underground Steam Construction Co., 73 Pitts St., Boston, Mass.
Unified Air Conditioner Co., Torry Bldg., Duluth, Minn.
Uniflow Mfg. Co., E. Lake Rd., Erie, Pa.
Union Asbestos & Rubber Co., 54th Ave. and 18th St., Cicero 50, Ill.
Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Union Iron Wks., 1500 Cascade St., Erie, Pa.
Union Metal Wks., 128 Carter St., Chelsea, Mass.
Union Steam Pump Co., Capitol Ave., S. W., Battle Creek, Mich.
Union Water Meter Co., 333 Hermon St., Worcester, Mass.
United Chromium, Inc., 51 E. 42nd St., New York 17, N. Y.
United Cork Companies, Central Ave., Kearny, N. J.
United Electric Controls Co., 69-71 A St., Boston 27, Mass.
United Metal Hose Co., Inc., 36-01 43rd Ave., Long Island City, N. Y.
● United States Air Conditioning Corp., 2101 Kennedy St., N. E., Minneapolis, Minn.
United States Brass & Copper Co., Hyde Park, Boston, Mass.
● United States Gauge Co., 14 Wall St., New York 5, N. Y.
United States Gypsum Co., 300 W. Adams St., Chicago 6, Ill.
United States Mineral Wool Co., 9 S. Clinton St., Chicago, Ill.
United States Ozone Co. of America, Crescent St., Scottdale, Pa.
United States Pipe & Foundry Co., Burlington, N. J.
United States Radiator Corp., 1500 United Artists Bldg., Detroit 31, Mich.
United States Register Co., Burnham St., Battle Creek, Mich.
United States Rubber Co., 1230 Sixth Ave., New York, N. Y.
● United States Steel Corp., 436 Seventh Ave., Pittsburgh, Pa.
● United States Steel Supply Co., 1319 W. Wabansia, Chicago, Ill.
United States Stoneware Co., 60 E. 42nd St., New York 17, N. Y.
United Superior Union Co., Inc., 29 Ryerson St., Brooklyn, N. Y.
Universal Air Filter Corp., 332 W. Michigan St., Duluth 2, Minn.
Universal Cooler Corp., Marion, O.
Universal-Cyclops Steel Corp., Bridgeville, Pa.
Universal Gypsum & Lime Co., 111 W. Washington St., Chicago, Ill.
Universal Motor Co., 323 Universal Ave., Oshkosh, Wis.
Universal Power Corp., 4930 Euclid Ave., Cleveland 3, O.
Universal Zonolite Insulation Co., 135 S. LaSalle St., Chicago 3, Ill.
Uno Ventilator Co., 565 Lincoln Ave., Cliftondale, Mass.
USHCO Mfg. Co., Inc., 135 Tonawanda St., Buffalo 7, N. Y.
Utica Radiator Corp., 2201 Dwyer Ave., Utica, N. Y.
Utility Fan Corp., 4851 S. Alameda St., Los Angeles 11, Calif.
Utility Laboratory, Inc., 330 36th St., Brooklyn, N. Y.

V

Vanderman Mfg. Co., Mansfield Ave., Willimantic, Conn.
Van Dorn Electric Tool Co., Towson, Md.
Van Noorden Co., E., 100 Magazine St., Boston, Mass.
Vapor Car Heating Co., Inc., 80 E. Jackson Blvd., Chicago, Ill.
Vapor Chemical Corp., 2531 Graybar Bldg., New York, N. Y.
Vapor Specialty Co., 101 W. 42nd St., New York, N. Y.
Ventilating Products Co., 2800 Cottage Grove Ave., Chicago, Ill.
Verson Allsteel Press Co., 93rd & Kenwood Ave., Chicago 19, Ill.
Vesco Corp., 1381 Sedgwick Ave., New York 52, N. Y.
● Vibration Eliminator Co., 8-22 Astoria Blvd., Astoria, N. Y.
Vibration Engineering Co., The, 521 Fifth Ave., New York, N. Y.
Victaulic Co. of America, 30 Rockefeller Plaza, New York 20, N. Y.
Victor Electric Products, Inc., 2950 Robertson Rd., Cincinnati, O.
Victor Equipment Co., 844 Folsom St., San Francisco 7, Calif.
Viking Air Conditioning Corp., 5600 Walworth Ave., Cleveland, O.
Viking Mfg. Corp., U. B. Bldg., 16th Floor, Dayton 2, O.
Viking Pump Co., Fourth and State Sts., Cedar Falls, Ia.
Viking Shear Co., 1063 W. 19th St., Erie, Pa.
Vilter Mfg. Co., 2148 S. First St., Milwaukee 7, Wis.
Vinco Co., Inc., The, 305 E. 45th St., New York 17, N. Y.
Virginia Smelting Co., West Norfolk, Va.
Vita-Screen Ventilator Co., 103 Park Ave., New York, N. Y.
Vogt Machine Co., Henry, 10th & Ormsby Sts., Louisville 10, Ky.
Vortex Mfg. Co., 687 N. Tillamook St., Portland, Ore.
Voss Co., J. H. H., 785 E. 144th St., Corner of Wales Ave., New York 54, N. Y.
Vulcan Electric Co., 88-90 Holten St., Danvers, Mass.
Vulcan Radiator Co., 26 Francis Ave., Hartford, Conn.

W

Wade Mfg. Co., Div. of Woodruff & Edwards, Inc., Elgin, Ill.
Wagner Electric Corp., 6400 Plymouth Ave., St. Louis 14, Mo.
Wailes Dove-Hermiston Corp., Westfield, N. J.
Waldron Corp., John, New Brunswick, N. J.
Walker Jamar Co., 367 S. First Ave., E., Duluth, Minn.
Wall Chemicals Div. of The Liquid Carbonic Corp., 625 W. Jackson Blvd., Chicago, Ill.

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● Wallace Supplies Mfg. Co., 1304 Diversey Pkwy., Chicago, Ill.
Wallace & Tiernan Co., Inc., P. O. Box 178, Newark 1, N. J.
Walsh-Holyoke Steam Boiler Co., Holyoke, Mass.
Walsh Refractories Corp., 4070 N. First St., St. Louis, Mo.
● Walworth Co., 60 E. 42nd St., New York, N. Y.
Ward Foundries, Inc., J. P., Blossburgh, Pa.
Ward Leonard Electric Co., 37 South St., Mt. Vernon, N. Y.
Warlo Corp., 330 W. 42nd St., New York, N. Y.
Warren Electric Appliance Co., Warren Bank & Trust Co. Bldg., Warren, Pa.
Warren Foundry & Pipe Corp., 11 Broadway, New York, N. Y.
Warren Steam Pump Co., Inc., 300 Bridges Ave., Warren, Mass.
● Warren Webster & Co., 17th and Federal Sts., Camden, N. J.
Washburne & Co., E. G., 207 Fulton St., New York, N. Y.
Water Cooling Corp., 71 Nassau St., New York, N. Y.
Water Cooling Equipment Corp., New Hampshire Ave. & Weber Rd., Affton Station, St. Louis 23, Mo.
Water Cooling Tower Co., 5501 Cornell Ave., Chicago, Ill.
Water Refining Co., 1123 Barthold, Ft. Wayne, Ind.
Water Service Laboratories, Inc., 423 W. 126th St., New York 27, N. Y.
Water Treatment Company of America, 1159 Hodgkiss St., Pittsburgh 12, Pa.
Waterfilm Boilers, Inc., 154 Ogden Ave., Jersey City, N. J.
Waterloo Register Co., 600 Anita St., Waterloo, Ia.
Watson & McDaniel Co., 440 N. Marshall, Philadelphia 23, Pa.
Watson-Stillman Co., 140 Aldene Rd., Roselle, N. J.
Watts Regulator Co., 10 Embankment St., Lawrence, Mass.
Waukesha Motor Co., Waukesha, Wis.
Waverly Heating Supply Co., 31 Union St., Boston, Mass.
Way Loctor Access Panel Co., 420 Boylston St., Boston, Mass.
Wayne Davies & Co., 325 W. Huron St., Chicago 10, Ill.
Wayne Oil Burner Co., 800 Glasgow Ave., Fort Wayne, Ind.
Weatherhead Co., 300 E. 131st St., Cleveland, O.
Weaver Mfg. Co., Springfield, Ill.
● Webster & Co., Warren, 17th & Federal Sts., Camden, N. J.
● Webster Engineering Co., 419 W. Second St., Tulsa, Okla.
Webster Tallmadge & Co., 364 Glenwood Ave., East Orange, N. J.
Wedge Protectors, Inc., 9522 Richmond Ave., Cleveland, O.
Weil-McLain Co., 641 W. Lake St., Chicago, Ill.
Weil Pump Co., 1528 N. Fremont St., Chicago, Ill.
Weinman Pump Co., 290 W. Spruce St., Columbus 8, O.
Weirton Steel Co., Weirton, W. Va.
Weiss & Co., H., 113-115 Mercer St., New York, N. Y.
Weksler Thermometer Corp., 52 W. Houston St., New York, N. Y.
Weldex, Inc., 7326 McDonald Ave., Detroit, Mich.
Welding Apparatus Co., 2750 W. Van Buren St., Chicago, Ill.
Werner Co., Inc., R. D., 380 Second Ave., New York 10, N. Y.
Westco Div., Pomona Pump Co. Div., Joshua Hendy Iron Works, 2621 Locust St., St. Louis, Mo.
Western Blower Co., 1800 Airport Way, Seattle, Wash.
Western Cartridge Co., Brass Mill Div., East Alton, Ill.
Western Chemical Co., 713 Washington St., Kansas City, Mo.
Western Engineering & Mfg. Co., 1726 E. Washington Blvd., Los Angeles, Calif.
Western Felt Wks., 4029-4117 Ogden Ave., Chicago, Ill.
Western Furnaces, Inc., 950 Commerce St., Tacoma 2, Wash.
Western Hanger Co., 55 New Montgomery St., San Francisco, Calif.
Western Mineral Products Co., 2602 Ed Creighton Ave., Omaha 1, Nebr.
Western Precipitation Corp., 1016 W. 9th St., Los Angeles, Calif.
Western Silicair Products, Inc., 72 W. Alameda Ave., Burbank, Calif.
Western Wire & Iron Works, Inc., 957 W. 18th Pl., Chicago 8, Ill.
Western Wire Products Co., 1415-35 S. 18th St., St. Louis, Mo.
Westfalia Separator Co., 30 Orange St., Bloomfield, N. J.
Westinghouse Electric & Mfg. Co., Bloomfield, N. J.
● Westinghouse Electric & Mfg. Co., Cleveland, O.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Westinghouse Electric & Mfg. Co., 653 Page Blvd., Springfield, Mass.
Westinghouse Electric & Mfg. Co., Mansfield, O.
Westinghouse Electric & Mfg. Co., X-Ray Div., 2519 Wilkens Ave., Baltimore, Md.
Weston Electrical Instrument Corp., 619 Frelinghuysen Ave., Newark 5, N. J.
Wheatland Tube Co., 606-608 Real Estate Trust Bldg., Philadelphia, Pa.
Wheelco Instruments Co., Harrison and Peoria Sts., Chicago 7, Ill.
Wheeler Mfg. Co., C. H., 19th, Lehigh & Sedgley Ave., Philadelphia, Pa.
Wheeling Machine Products Co., Wheeling, W. Va.
Wheeling Steel Corp., Wheeling Steel Corp. Bldg., Wheeling, W. Va.
White Flo-Matic Corp., 1 Mechanic St., Hoosick Falls, N. Y.
White Mfg. Co., 2362 University Ave., St. Paul, Minn.
● White-Rodgers Electric Co., 1209 Cass Ave., St. Louis, Mo.
Whiting Corp., Harvey, Ill.
Whiting Stoker Co., 4711-21 W. North Ave., Chicago 39, Ill.
● Whitlock Mfg. Co., 100 South St., Hartford, Conn.
Whitney Chain & Mfg. Co., The, Bartholomew Ave., Hartford, Conn.
Whitney Mfg. Co., W. A., 636 Race St., Rockford, Ill.
Whitney Metal Tool Co., 110 Forbes St., Rockford, Ill.
Whittington Pump & Engineering Co., 225 S. Meridan St., Indianapolis 4, Ind.
Whitty Co., Inc., 86 Western Ave., Boston 34, Mass.
Wickes Boiler Co., 502 N. Water St., Saginaw, Mich.
Wickes Bros., 500 N. Tilden St., Saginaw, Mich.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York 18, N. Y.
Weidemann Machine Co., 1815 Sedgley Ave., Philadelphia 32, Pa.
● Wiegand Co., Edwin L., 7610 Thomas Blvd., Pittsburgh, Pa.
Wiggins Oil Tool Co., Inc., E. B., 3424 E. Olympic Blvd., Los Angeles 23, Calif.
Wilcolator Co., 1001 Newark Ave., Elizabeth, N. J.
Wilhelm Co., A., 3rd and Bern Sts., Reading, Pa.
Will Corp., 35 Russell St., Rochester, N. Y.
Will-Burt Co., The, Orrville, O.
● Williams & Co., J. H., Buffalo, N. Y.
Williams Gauge Co., 1620 Pennsylvania Ave., N. S., Pittsburgh 12, Pa.
Williams, Inc., F. C., 6661 Chase Rd., Dearborn, Mich.
Williams Oil-O-Matic Heating Corp., 1201 East Bell, Bloomington, Ill.
Williams & Son, I. B., Dover, N. H.
Williams Valve Co., D. T., Spring Grove Ave. & Township St., Cincinnati, O.
Williamson Heater Co., 337 W. Fifth St., Cincinnati, O.
Williamsport Engine & Machine Co., 1306 Memorial Ave., Williamsport, Pa.
Willis Steel Corp., 156 N. Academy St., Galesburg, Ill.
Willson Products, Inc., 348 Thorn St., Reading, Pa.
Will-Weld Mfg. Co., Inc., 600-620 S. 15th St., Omaha 2, Nebr.
Willy's Carbide Tool Co., 1340 W. Vernor Highway, Detroit, Mich.
Wilson & Co., 4100 S. Ashland Ave., Chicago, Ill.
Wilson Co., H. A., The, 105 Chestnut St., Newark, N. J.
● Wilson, Inc., Grant, 4115 W. Taylor St., Chicago 24, Ill.
Wilson Welder & Metals Co., Inc., 60 E. 42nd St., New York, N. Y.
Wind-Way Fan & Ventilator Co., 527 St. Joseph St., New Orleans, La.
● Wing Mfg. Co., L. J., 14th St. & 7th Ave., New York, N. Y.
Winkler & Sons, Inc., A. E., 2337 N. 31st St., Milwaukee 10, Wis.
Wipe-On Corp., 105 Hudson St., New York, N. Y.
Wiss & Sons Co., J., 33 Littleton Ave., Newark 7, N. J.
Witte Engine Works, 1600 Oakland St., Kansas City 3, Mo.
Wittenmeier Machinery Co., 850-860 N. Spaulding Ave., Chicago 51, Ill.
Wodack Electric Tool Corp., 4627 W. Huron St., Chicago 44, Ill.
Wolfe-Kote Co., 705 Center Ave., Sheboygan, Wis.
Wolff & Munier, Inc., 222 E. 41st St., New York, N. Y.
Wolverine Tube, Div. of Calumet and Hecla Consolidated Copper Co., 1411 Central Ave., Detroit 9, Mich.
Wood Conversion Co., 1981 First National Bank Bldg., St. Paul 1, Minn.
Wood Steel Co., Alan, Conshohocken, Pa.
Wood's Sons Co., T. B., 1275 Fifth Ave., Chambersburg, Pa.
Wooster Art Wood, Inc., P. O. Box 198, Wooster, O.
Worner Electronic Devices, 848 N. Noble St., Chicago 22, Ill.
● Worthington Pump & Machinery Corp., Harrison, N. J.
● Worthington Pump & Machinery Corp., Air Conditioning & Refrigeration Div., Harrison, N. J.
Worthington-Gamon Meter Co., Harrison, N. J.
Wright-Austin Co., 315 W. Woodbridge St., Detroit 26, Mich.
Wyckoff & Son Co., A., 100 Home St., Elmira, N. Y.

X

● X Laboratories, Inc., 25 W. 45th St., New York 19, N. Y.
X L Refrigerating Co., 1834 W. 59th St., Chicago, Ill.
X-Pando Corp., 43-15 Thirty-Sixth St., Long Island City, N. Y.

Y

Yale & Towne Mfg. Co., Stamford, Conn.
Yardley Plastics Co., 138 Parsons Ave., Columbus 15, O.
Yardley Screen & Weather Strip Co., 138 Parsons Ave., Columbus 15, O.
● Yarnall-Waring Co., Chestnut Hill, Philadelphia 18, Pa.
Yates-American Machine Co., Beloit, Wis.
Yeomans Bros. Co., 1433 N. Dayton St., Chicago 22, Ill.
Yoder Co., The, 5500 Walworth Ave., Cleveland 2, O.
York Corrugating Co., Adams St. & W. M. R. R., York, Pa.
York Corp., Roosevelt Ave., York, Pa.
York Electric & Machine Co., 30-34 N. Penn St., York, Pa.
York-Heat Div., York-Shipley, Inc., P. R. R. & Jessop Pl., York, Pa.
Yost Mfg. Co., Meadville, Pa.
Young & Bertke Co., 1004-1014 Hulbert Ave., Cincinnati 14, O.
● Young Radiator Co., 709 S. Marquette St., Racine, Wis.
Young Regulator Co., 4500 Euclid Ave., Cleveland, O.
● Youngstown Sheet & Tube Co., Stambaugh Bldg., Youngstown, O.

Z

Zallea Brothers & Johnson, Taylor and Locust St., Wilmington, Del.
Zapon Div., Atlas Powder Co., North Chicago, Ill.
Zeh & Hahnemann Co., 182-200 Vanderpool St., Newark, N. J.
Zenith Electric Co., 152 W. Walton St., Chicago 10, Ill.
● Zink Co., John, 4401 S. Peoria St., Tulsa, Okla.

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HEATING, PIPING & AIR CONDITIONING, published monthly by Keeney Publishing Co., 6 N. Michigan Ave., Chicago 2, Ill., U. S. A. Subscription rates: U. S. and possessions, Canada, Mexico, Central America, South America, $2.00 per year; other $4.00. Current copies, U. S. and possessions, 25 cents. Back numbers, 50 cents. December, 1944. Vol. 16, No. 12. Entered as Second Class Matter May 18, 1929, at the Post Office at Chicago, Ill., U. S. A., under the Act of March 3, 1879.